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OF

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FEBRUARY, 1928

INSTITUTED 1847

THE NEW YORK ACADEMY OF MEDICINE
Fifth Avenue and 103rd Street
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BULLETIN OF
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PAPERS DELIVERED AT THE STATED MEETING OF OCTOBER 6, 1927

THE COST OF MEDICAL SERVICE

(Abstract)

LOUIS I. DUBLIN, Ph.D.

Statistician, Metropolitan Life Insurance Company, New York

It has been estimated that sickness costs the United States a total of over two billion dollars a year, and this is three and one-half per cent. of the country's total income. Two per cent. of the population is at all times so ill as to require medical attention. Their care necessitates the services of more than 150,000 physicians, 50,000 dentists, 300,000 nurses (trained and practical) and 100,000 additional attendants of various kinds. When the cost of hospitals, convalescent homes and other institutions, as well as drugs and surgical appliances is included, it is not difficult to account for the two billion dollar estimate.

It is unfortunate that no very satisfactory data are available to show what the average family pays per year for medical service. Data do not cover at all that large group of the population generally described as "the middle class," or people having an annual income ranging between $3,500 and $20,000. Practically all our existing information concerns the wage-earning groups of the population. A study of annual expenditures for the various items in the family budget, made some years ago by the U. S. Bureau of Labor Statistics among 12,000 workingmen's families, showed the average expenditure for sickness care to be about $60 a year. Clerical workers of a large insurance

company—a somewhat more prosperous group, spent approximately $80 a year per family for sickness.

A sum of sixty, eighty, one hundred, or even a hundred and fifty dollars, is not a large enough amount to embarrass unduly the average family, were it not for the fact that sickness is so unevenly distributed. During many years, the ordinary family may go along without any heavy outlay, though there will undoubtedly be slight expenditures for drugs, dental care and other health incidentals. But when a maternity case occurs, or an illness requiring long-continued treatment or perhaps an operation, the family faces a very serious emergency. Surgical care is relatively very expensive, even when low-priced hospital wards are utilized. Surgeons and specialists' fees, nursing services and private hospital accommodations make the cost staggering for people with moderate incomes.

This situation is nobody's fault. The average family doctor does not charge exorbitantly in view of the long period of education which medicine requires, the heavy overhead of his office, and the other factors which he must consider to make a living. The average earnings of physicians in the United States are only about $3,000 to $3,500 a year; and the skill demanded of doctors more than justifies such a rate of compensation. Other factors, however, complicate the situation. First, the fees charged by specialists and surgeons are out of all proportion to those received by the average general practitioner who, after all, is burdened with the heaviest responsibility for the health and well-being of his patients. Second, the concentration of physicians in the cities leaves a serious dearth of skilled doctors in our rural areas. Most doctors, moreover, grade their charges according to the patient's ability to pay; though no other business or profession is run on such a plan. And finally, private medical practice from its very nature is bound to be expensive because of the waste of the doctor's time, the idleness of the expensive equipment which he must maintain, and the other inefficiencies of organization inherent in the system.

What is the way out of this impasse? A few developments of recent years are highly suggestive. Group medicine, although the word is anathema to some of the medical profession, would

seem to offer a partial solution. There are in existence already a number of interesting and successful experiments. We may mention in passing the extremely valuable service being rendered by the Cornell University Pay Clinic, which is now running on a practically self-supporting basis; the number of patients on its books is steadily increasing and apparently the service rendered is acceptable to an ever-expanding group of patients. In the colleges, universities and secondary schools of the country, medical departments have been organized on a group basis and these furnish excellent health care to the student body at nominal cost. In industry there has been a phenomenal growth in industrial hygiene and an ever-increasing number of medical departments are being organized by employers for the avowed purpose of conserving the health of their workers. These experiments are worthy of the most careful attention and study. Valuable experience is being collected which we will be able to utilize wisely in the future. Of course, underlying any plan of group medicine and fundamental to its success would be the principle that all members of the medical and surgical staffs should be compensated fully and fairly for all services rendered.

And, finally, there is one remedy which does not concern the organization of medicine at all, but that seeks to build up funds with which to pay medical bills when sickness occurs. The modern idea of insurance is based on the principle that large numbers of people voluntarily banding together for their own protection may easily, through the payment of fixed premiums, provide funds to meet the various contingencies of life such as death, unemployment and ill health. Health insurance is an established institution abroad; and apparently on the whole, the compulsory systems established in Germany, England and other European countries are working out successfully. At least, there has been no tendency to cut down their scope and there is every indication that the medical service which they render is as good as the great mass of working people have ever hitherto enjoyed. We do not favor compulsory health insurance in this country; for it is obviously counter to popular sentiment. But we do maintain that there are enough private insurance companies in the United States who are able to carry this type of

insurance efficiently and economically with benefit to all concerned. Millions of American wage-earners are now covered by either personal or group health insurance. In the last analysis, we will solve our economic problem of sickness costs only when health insurance becomes as popular among wage-earning families as industrial life insurance now is. In advocating health insurance there is no attempt to interfere with the highly personal relationship now existing between patient and doctor; what we have in mind is to formulate a plan whereby there will be assured funds to meet the doctor's just fees, when they become due.

THE PREVALENCE OF ILL HEALTH[1]

EDGAR SYDENSTRICKER

Statistician in the United States Public Health Service, and Statistical Consultant to the Milbank Memorial Fund

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Problems yet unsolved

Nearly 350 years ago, Christopher Marlowe had *Faustus*, in his soliloquy upon the choice of a profession, weigh the success of medicine in these words:

> "*Summum bonum medicinae sanitas.*
> The end of physic is our body's health.
> Why, Faustus, hast thou not attained that end?
> Are not thy bills hung up as monuments, whereby
> Whole cities have escap'd the plague, and
> Thousand desperate maladies been cured?"

So to-day, without the pessimism or the sophistry, I hope, of the master of the black art and surely without his motives, we may apply his test in measuring the success of preventive medicine. It is true that plagues and pestilences such as those which flourished in Marlowe's and Shakespeare's day have been ban-

[1] From the Office of Statistical Investigations, U. S. Public Health Service.

ished from the modern part of the world at least; that many more maladies have yielded to modern treatment; that millions of sick have been relieved from their suffering and that millions more have escaped disease and have lived lengthened lives. These achievements are monuments indeed to the discoveries, the science, and the unselfish art of medicine. Yet the goal of preventive medicine, which is a healthy people, is far from being reached and the *curative* skill of a great army of physicians is still needed. Why have we not attained that end?

In response to the invitation with which you have honored me I can not presume to attempt an answer to so comprehensive a question. You, better than any others, know the prevalence of disease in our day and generation, and I shall not be able to add to that intimate knowledge you have gained by daily experience with the sick and the impaired and by researches out of which you have made so many valuable contributions to the science and practice of medicine. But perhaps as a collector and analyst of facts in the mass, who has devoted some years to an attempt to delineate the problems of health in statistical terms, I can be of some service in summarizing, in crude outline, what we know about the prevalence of disease in our population. Surely it will do us no harm—indeed, it is necessary to the proper development of effective prevention of ill health—for us to have a glimpse now and then of the situation as a whole.

Before attempting to do this, however, I suppose we should try to define what we mean by ill health and to select the scale by which we are to measure it.

Ill Health a Relative Term

What is ill health? To say that ill health is a deviation from "normal" health is merely to indulge in one of those impressive but unsatisfying dictionary definitions. For, how much of morbidity itself is "normal" reaction, in the process of natural adjustment to environment, as Haldane suggests? How many impairments and conditions, commonly denoted as "disease," are merely signs of "normal" wearing out of human clocks, some of whom, to use Pearl's metaphor, are set by heredity to run a longer time than others? When is death itself "normal"—at

three score years and ten, or at the century mark, or at 200 years, or even at Methuselah's reputed age? How long a time, in fact, did Methuselah take to *die* in? I am afraid that so purely philosophical a consideration will lead to nothing more than obfuscation. So let us concede at the outset that health or ill health is a relative thing, measurable at present only by some assumed standard with which we are all more or less familiar, even if not in strict agreement upon. In fact, no criterion can be very exact for several reasons, one of which is that physicians, upon whom we depend for most of our data, do not agree invariably in their diagnoses. Yet the statistical picture, if we do not try to fill in too much detail, will not be without interest and considerable accuracy.

Indices of Ill Health

The indices of ill health at present available to us for statistical purposes are:

(1) Death rates, specific for sex, age and cause, or some life table expression such as the expectancy of life or the probability of dying at a given age;
(2) Morbidity rates among persons of given sex and age based either upon the frequency of sickness from a specific cause during a given period of time, or upon the prevalence of illness from such a cause at an instant in time;
(3) Physical impairment rates among persons of given sex and age for a specific type of impairment as ascertained by an examination or by repeated observations.

It is understood, of course, that unless a group of persons is selected for some specific purpose, the group for which we desire these indices of ill health should be a fair sample of the population.

The inadequacy of death rates as indices of ill health.—The use of death rates as indices of the prevalence of disease has been so universal that the problems and aims of public health are set forth almost entirely in lethal terms whenever statistics are used. This is unfortunate. One effect of a prolonged dependence upon mortality statistics has been to vitiate in some degree the mortality statistics themselves. For, by reason of a laudable

desire to ascertain the prevalence of tuberculosis or cancer, for example, vital statisticians have classified deaths under that title even when the attending physician reports it on the death certificate as merely contributory to the actual cause as he observed it. More deplorable than this statistical practice is the gradual education of the physician himself into this procedure. Another effect of too great emphasis upon mortality statistics has been to foster a fallacious premise for public health work, namely, that a low death rate necessarily indicates the absence of ill health. Obviously it does not. We know that, on the contrary, an exceedingly unhealthful region may exhibit a mortality which is not extremely high, as, for example, a heavily infested hookworm locality, or a section abounding in malaria. Pellagra may be widely prevalent in a community without affecting materially its general death rate or even causing a large number of deaths from the disease itself. Instances of the same sort could be multiplied. Much ill health that is manifested in symptoms, in discomfort, in lessened vigor and efficiency, even in illness and suffering, is not reflected in the death rate, except for certain diseases, for any practicable purpose in preventive work.

What really matters more to the sanitarian and the physician, therefore, in their scientific searching for causes and conditions and in their preventive work, is not deaths but *ill health*. Of far greater importance than mortality rates and life table expressions is a view of the health situation depicted by *physical impairments* as revealed by competent medical examination, and by morbid conditions as ascertained by adequate records of *sickness*. If such a view were permitted, it will hardly be denied that the resulting change in perspective would lead us to modify considerably our schemes for research and our program of effort.

I shall not, therefore, use mortality rates in this brief discussion on the prevalence of ill health except in an incidental way.

The kind of indices needed.—Furthermore, it must be obvious from clinical experience as well as from considerations of a practical nature that the full extent of ill health and its kinds can not be ascertained by any one method. Properly conducted physical examinations, supplemented by the necessary laboratory findings, yield certain indispensable indications of the existence and the net results of various diseases and conditions; but they

will not tell the whole story. A carefully obtained history of prior attacks of disease, symptoms, and exposure to certain possibly relevant conditions for each individual will add to the picture. Of undoubted importance is a period of observation during which the reactions of the individual under ordinary as well as under extraordinary circumstances are recorded; this record may be of the occurrence of various symptoms and of the extent to which the subject is affected—whether only slightly ill, or more or less continuously "below par," or unable to engage in his usual activities, or disabled for long periods, or dying. The detail and accuracy with which these observations are made depend, naturally, upon the means employed. Unfortunately no such combination of records is yet available for any considerable sample of our population, and for the present we must be content with observations made according to one method for one sample and records obtained by another method for another.

What Physical and Medical Examinations Show

Let us consider first the findings from physical examinations. Such records are numerous but unfortunately they are not comparable as to terminology or as to the methods employed. I shall refer to but three series of records which probably approximate more closely than other series what the medical findings would be for samples of the general population.

One series is the reported defects in about two and one-half million men registered and examined in pursuance of the selective service act in 1917–1918. All of us are more or less aware of the unavoidable weaknesses of these findings, due principally to the fact that they were not made primarily for a complete appraisal of the health of these men. The gross results, however, are illuminating. Another sample is that afforded by the examinations made by the Life Extension Institute as recently reported by Dublin, Fisk and Kopf, covering nearly 17,000 male policy holders of the Metropolitan Life Insurance Company. (See Table 1.) A third sample consists of about 10,000 employees of industrial establishments who were given physical examinations by medical officers of the United States Public Health Service in the course of its studies in industrial hygiene, as reported by Britten and Thompson. (See Table 2.)

TABLE 1

NUMBER OF CERTAIN PHYSICAL IMPAIRMENTS PER 1,000 MEN EXAMINED AT DIFFERENT AGES*

16,662 white males insured in the Metropolitan Life Insurance Company, Ordinary Department, 1921

Impairment	All ages	Age group				
		Under 25	25–34	35–44	45–54	55 and over
Number of persons in specified age group	16,662	861	5,885	5,799	3,023	1,094
Nose and throat:						
Enlarged septic or buried tonsils	262	340	328	256	171	130
Hypertrophic rhinitis, enlarged turbinates	148	190	169	151	107	101
Teeth and root infection:						
Pyorrhea, definite	48	12	27	57	71	74
Heart and pulse:						
Mitral murmur, stenosis	2	2	2	1	2	4
Mitral murmur, regurgitation	7	3	7	5	9	15
Aortic murmur, stenosis	1	–	1	1	–	2
Aortic murmur, regurgitation	–	–	–	–	1	1
Blood-vessels and blood pressure:						
Marked arterial thickening	6	1	4	3	7	37
Blood pressure, 60 or more above average	3	1	–	1	7	23
Stomach; abdominal organs:						
Hemorrhoids	123	44	93	128	177	163
Inguinal hernia, no truss	22	14	14	22	31	48
Inguinal hernia, truss worn	29	2	14	26	51	82
Urinary findings:						
Albumin, marked amount	8	14	7	7	9	12
Sugar, marked amount (quantitative)	5	1	3	3	10	11
Casts, granular or epithelial	4	3	–	5	7	8
Casts, hyaline	41	42	30	40	53	75
Indican	39	31	40	40	37	44

* Data from Dublin, Fisk and Kopf: "Physical Defects as Revealed by Periodic Health Examinations."

TABLE 2

NUMBER OF DEFECTS AND DISEASES PER 1,000 EMPLOYES OF VARIOUS INDUSTRIAL ESTABLISHMENTS AT DIFFERENT AGES*

10,062 White Males Examined by Medical Officers of the United States Public Health Service, 1914–1924.

Impairment	All ages	Age group									
		Under 20	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and over
Number of persons	10,062	494	1,405	1,845	1,739	1,561	1,127	813	510	305	263
Digestive:											
Constipation	158	109	118	133	186	153	189	183	165	170	228
Other digestive[1]	81	73	59	69	84	80	102	87	110	79	87
Eye and ear:											
Inflamed eyes	120	71	81	106	105	138	146	175	165	138	129
Impaired hearing	212	81	104	131	158	208	260	326	365	443	502
Other ear defects	55	51	56	62	55	57	46	53	51	56	49
Heart:											
Organic heart	37	18	21	32	35	26	52	45	61	65	87
Enlarged heart	39	30	34	30	29	31	51	50	65	62	110
Irregular heart	20	34	15	18	15	19	19	17	18	36	53
Other circulatory:											
Arteriosclerosis—											
Marked	32	4	8	14	19	27	49	49	75	105	167
Slight	67	12	36	48	49	70	77	99	141	148	198
Hernia, varicose veins, etc:											
Hernia	99	53	67	89	90	108	121	127	127	128	182
Enlarged rings	26	14	27	34	26	35	18	20	18	23	8
Varicocele	53	40	46	50	52	60	48	81	43	46	49
Varicose veins	59	4	21	27	55	78	81	111	102	128	99
Flat feet—											
With symptoms	16	6	15	18	25	21	17	2	12	13	4
Without symptoms	161	103	198	184	187	169	147	122	102	92	76

TABLE 2—(*Continued*)

Impairment	All ages	Age group									
		Under 20	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and over
Number of persons	10,062	494	1,405	1,845	1,739	1,561	1,127	813	510	305	263
Nose and throat:											
Chronic diseases of nasal pharynx	428	330	491	493	458	440	381	367	331	302	266
Enlarged tonsils	169	222	218	219	171	174	115	116	98	79	38
Diseased tonsils	103	85	95	114	114	106	110	106	75	79	49
Respiratory:											
Tuberculosis	25	10	16	23	26	37	21	33	29	13	23
Bronchitis (acute and chronic)	45	45	26	39	37	49	60	52	73	59	49
Emphysema	11	–	2	5	5	12	15	27	31	36	27
Skin	81	87	111	95	77	72	79	68	51	36	34
Teeth:											
Pyorrhea	296	83	177	231	291	356	392	415	400	387	388
Defective teeth	305	215	182	199	240	352	390	459	502	544	536
Miscellaneous:											
Hemorrhoids	104	4	45	75	106	119	142	170	149	190	148
Venereal diseases	9	10	12	14	9	4	6	6	10	7	8

* Data from Britten and Thompson: "Health Study of 10,000 Male Industrial Workers."

[1] Includes diarrhea.

Now, although the findings of these three series of physical examinations are not as comparable as we would wish and although they in all probability are a *minimal* statement of the actual conditions, they afford facts which are of grave import to sanitarians and physicians. I shall try to summarize them in a single sentence: A large proportion—the exact percentage, whether it be ten or thirty, does not matter just now—of our adult population at ages when they ought to be at their fullest vigor have serious impairments of the respiratory, circulatory, digestive and eliminatory systems, and are actually affected with diseased conditions, which result sooner or later in morbid states, with varying degrees of inefficiency, suffering and fatality.

What Sickness Records Show

The most satisfactory measure of ill health that we now have is morbidity, and it is to some new statistics of sickness that I wish to invite your attention for the remainder of my remarks.

You are familiar, of course, with the extensive sickness surveys made by Dr. Dublin and his associates which showed that the *prevalence rate* of sickness in a large sample of our population is about 2 per cent. By this prevalence rate we mean that 2 per cent. of the population was found to be actually sick at a given instant in time and, since the observations were made in urban as well as rural areas, upon persons of both sexes and all ages, and at different seasons of the year, may be used as the basis for an estimate that not less than 2,300,000 persons, probably more, of our population are constantly sick.

Another way of measuring the amount of ill health is by the frequency, or the *incidence rate*, of sickness during a given period of time. Considerable European as well as American experience has been accumulated showing the number of illnesses of various durations and degrees of severity. Since most of this experience relates to special groups, I shall not attempt to summarize it here. Instead, I venture to present the gross results of a morbidity study covering a general population group which was under observation for over two years. So far as my associates and I are aware, this is the most extensive record of this kind yet made.

The Hagerstown Morbidity Study

This study, which has come to be known as the "Hagerstown morbidity study," included 16,517 "years of observation," or an equivalent of a population of 7,079 persons observed continuously for 28 months. Only white persons, practically all of whom were native born, were included. No predominant industry is situated in this city of 30,000 population, and it may be said to be typical of many other cities of its size in the eastern section of the United States. The principal objective of this study was a record of illnesses that were experienced by a population group composed of persons of all ages and both sexes, and in no remarkable respect unusual. The records of "illness" obtained were of illnesses as reported to experienced field investigators who visited each family every 6 to 8 weeks, the reports being made by the household informant (usually the wife) either as experienced by herself or as she observed them in her family; the definition of the term thus can not be refined any further than the common understanding of the word, although the diagnoses in practically all illnesses having medical attention were confirmed by the attending physicians. Since *attacks* rather than ill health were recorded, the record of persons affected with chronic conditions is complete to the extent to which these persons suffered ill effects of these conditions *during the period* of observation.

The results of the study indicated that we had secured a fairly accurate record of real illnesses. As a matter of fact, less than 5 per cent. of the illnesses of exactly stated durations recorded were one day or less in duration. Nearly 80 per cent. were three days or longer, and 60 per cent. were eight days or longer in duration. Approximately 40 per cent. were not only disabling but caused confinement to bed. It is evident, therefore, that in the main the illnesses recorded were more than trivial in their character, in spite of the fact that in some instances mere symptoms were given as diagnoses. The incidence of acute attacks of specific and generally recognizable diseases, was, we feel, recorded with a satisfactory degree of completeness. On the other hand, the incidence of mild attacks, as for example, of coryza, was quite incomplete as judged by records of minor

respiratory attacks obtained later upon other population groups.

The gross illness rate.—A total of 17,847 illnesses were recorded, which gave an annual rate for the 28 months period of 1080.5 per 1,000 population, or about one illness per person per year. The death rate was 9.3 per 1,000. The annual incidence rate for illnesses was 116 times the annual death rate in the same population; it was 107 times the annual death rate of the total white resident population of Hagerstown. If this ratio of illnesses to deaths is anywhere near that which would be found for the general population, the guess may be ventured that upon a rate of 1.0805 annual illnesses lasting three days or longer per person, the illnesses in 1922–23 among the population of the United States would have approximated the impressive total of 120 millions per year. If one takes the death rate in the mortality registration area as a basis, which was about 12.05 per 1,000 in 1922–23, and the ratio of 107 illnesses per death, the still more imposing total of over 140 million illnesses per year would be indicated. One hesitates to stretch the validity of a study of a small sample, however carefully made, by using it as the basis of broad estimates for larger populations. If it pleases any one to play with figures in this manner, probably these estimates are not so far off.

The results of such a study can not be presented in detail in a single paper, but I shall select three phases that may be of especial interest to you, namely: (1) The variation in the morbidity rate according to age; (2) the general nature of the conditions recorded; and (3) the extent to which sickness in this sample population received medical and hospital care.

The illness rate at different ages.—When we consider the frequency of illness among persons of different ages, as is shown in Table 3 and Fig. 1, two rather striking indications were given by this series of observations. First, the extraordinarily high incidence of sickness shown in early childhood was a rather surprising result. Illness was far more frequent under 10 years of age than at any other period of life. Second, the interesting suggestion was afforded that the average individual is most free from illness in the age period 15–24 years. Thereafter, sickness

TABLE 3

INCIDENCE OF ILLNESS FROM ALL CAUSES AMONG A GROUP OF WHITE PERSONS OBSERVED IN HAGERSTOWN, MD., DECEMBER 1, 1921–MARCH 31, 1924

Age, in years	Annual rate per 1,000	Number of illnesses
0– 4	1,588	2,822
5– 9	1,554	3,270
10–14	1,187	2,034
15–19	764	1,062
20–24	712	809
25–29	825	1,020
30–34	920	1,136
35–44	924	2,006
45–54	1,009	1,691
55–64	959	863
65 and over	1,080	875

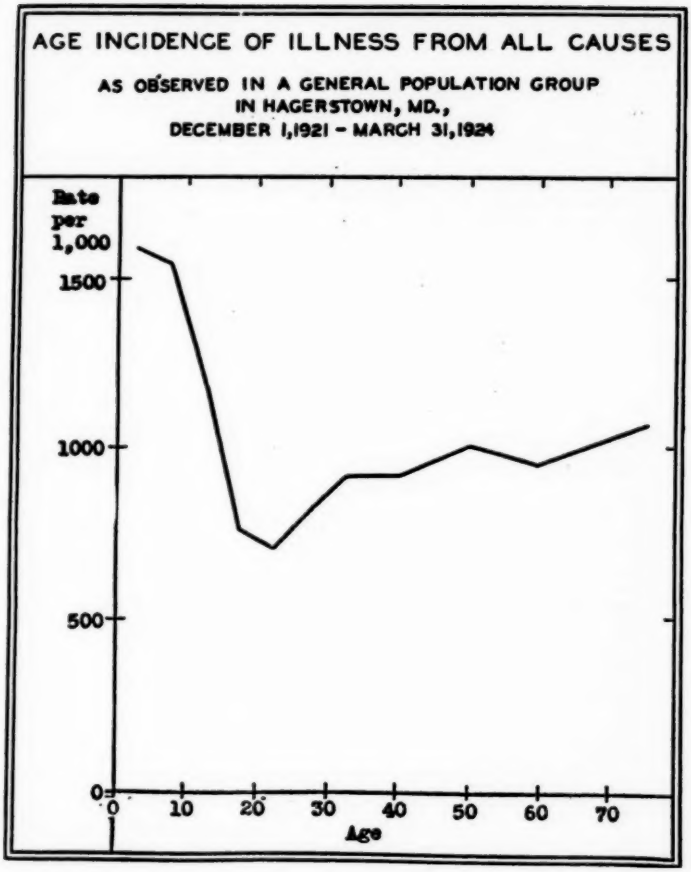
becomes more frequent as age advances[2] and, it may be added, upon the basis of other studies as well as our own, sickness becomes more severe and more frequently fatal.

The question naturally suggests itself: Just what does this variation according to age in the morbidity rate mean? Does it indicate that a greater proportion of the population in one age group was sick than in another, or does it signify that the higher incidence rate was due to the greater frequency of sickness in a sickly moiety of the group? Or do both conditions prevail?

"Sickly" and "well" persons in different age groups.—A more satisfactory answer could be given had we the time to consider the details of the causes and conditions of the illnesses recorded, but a broad interpretation of one meaning of the morbidity curve is suggested by the distribution of the individuals within each age group according to frequency of illness during the period of observation. Selecting those individuals who were under observation for 26 months or longer, excluding children under two years of age, and classifying them into two groups—(*a*) those suffering no illness during the entire 26 months' period, and (*b*)

[2] Industrial sickness experience sometimes shows a declining frequency as age advances in the age group 20–44, which apparently is due to an elimination of sickly individuals and to an adjustment to industrial environment on the part of those who remain at work.

FIG. 1


AGE INCIDENCE OF ILLNESS FROM ALL CAUSES
AS OBSERVED IN A GENERAL POPULATION GROUP
IN HAGERSTOWN, MD.,
DECEMBER 1, 1921 - MARCH 31, 1924
Rate per 1,000
1500
1000
500
0
0
10
20
30
40
50
60
70
Age

those ill four or more times, two age curves appear in sharp contrast—the "curve of good health," as indicated by the proportion of persons free from illness, which is lowest in childhood, sharply rising through adolescence to its maximum in the early adult years, and thereafter gradually declining until the end of the life span, and the "curve of ill health," as indicated by the proportion of persons suffering frequent illness, which is almost the obverse. (Table 4, Fig. 2.)

TABLE 4

PROPORTION OF WHITE INDIVIDUALS IN HAGERSTOWN, MD., OBSERVED FOR 26–28 MONTHS, WHO WERE FREE FROM ILLNESS OR WHO SUFFERED FREQUENT ATTACKS, BY AGE GROUPS

Age, in years	Per cent. of total in each age group	
	Not ill	Ill 4 or more times
2– 4	4.7	44.4
5– 9	7.4	45.5
10–14	14.8	27.1
15–19	25.7	14.3
20–24	29.6	10.5
25–29	23.9	16.4
30–34	22.8	18.4
35–44	25.0	21.2
45–54	21.5	22.6
55–64	21.2	21.9
65+	15.7	20.0

Resistance to death at different ages.—The further query suggests itself: At what age is the individual least able to withstand disease after he has been attacked? One way to measure this is to compare the number of illnesses per death at different ages. (Table 5, Fig. 3). This shows that the greatest resistance to death is in childhood, the age period 5–14; his lowest resistance is in infancy and early childhood (0–4 years), and in middle and old age. Ability to survive illness thus varies markedly from resistance to illness at different ages, particularly in childhood (5–14), when the average individual suffers from illness frequently but has a relatively small chance of dying, and in the

FIG. 2

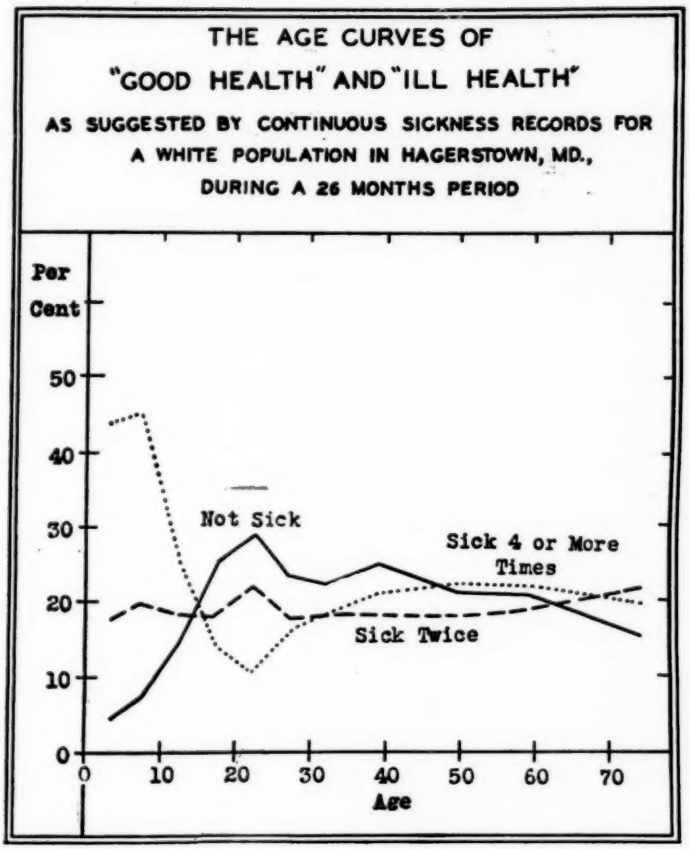
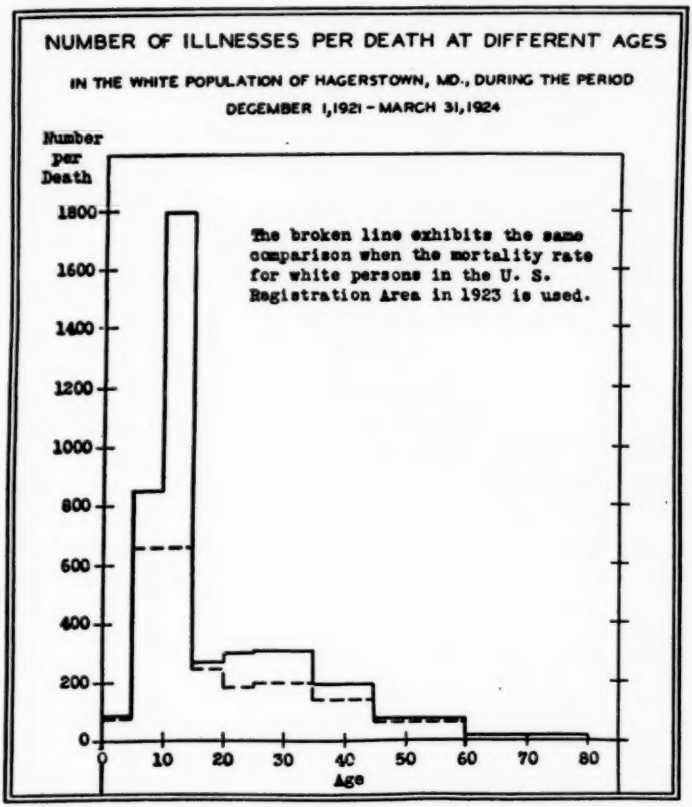

THE AGE CURVES OF
"GOOD HEALTH" AND "ILL HEALTH"
AS SUGGESTED BY CONTINUOUS SICKNESS RECORDS FOR
A WHITE POPULATION IN HAGERSTOWN, MD.,
DURING A 26 MONTHS PERIOD
Per Cent
50
40
30
20
10
0
Not Sick
Sick 4 or More Times
Sick Twice
0
10
20
30
40
50
60
70
Age

TABLE 5

RATIO OF ILLNESSES TO DEATHS AT DIFFERENT AGES

Age, in years	Annual rate per 1,000 of population			Number of illnesses per death		
	Dec. 1, 1921–Mar. 31, 1924		Deaths in registration area of United States in 1923	Illness rate in observed white population in Hagerstown, Md., to death rate in—		Disabling sicknesses to deaths in total membership of Leipzig Sick Fund, 1887–1905
	Illness in an observed group	Deaths in total resident population		White resident population of Hagerstown, Dec. 1, 1921–Mar. 31, 1924	White population of registration area, 1923	
0– 4	1,588	17.56	21.38	90	74	.....
5– 9	1,554	1.83	2.35	850	661	.....
10–14	1,187	.66	1.80	1,798	659	383
15–19	764	2.90	3.10	263	246	129
20–24	712	2.47	3.95	288	180	79
25–34	872	2.89	4.51	304	193	70
35–44	924	4.85	6.70	191	139	52
45–64	991	14.34	16.13	69	61	26
65 and over	1,080	83.08	81.6	13	13	12

FIG. 3


NUMBER OF ILLNESSES PER DEATH AT DIFFERENT AGES
IN THE WHITE POPULATION OF HAGERSTOWN, MD., DURING THE PERIOD
DECEMBER 1,1921 - MARCH 31,1924
Number per Death
1800
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
Age
The broken line exhibits the same comparison when the mortality rate for white persons in the U. S. Registration Area in 1923 is used.

older years when not only does his susceptibility to illness increase but also his chances of death. This is due partly, of course, to differences in the nature of the illnesses occurring at these ages and partly to the diminished ability to resist the diseases which manifest themselves in morbidity.

Kinds or "causes" of illness contrasted with mortality.—The picture given by a record of morbidity according to cause (Table 6, Fig. 4)—or, more precisely, according to the *kind* of morbidity

TABLE 6

ILLNESS AND DEATH RATES IN HAGERSTOWN, MD., BY GROUPS OF CAUSES

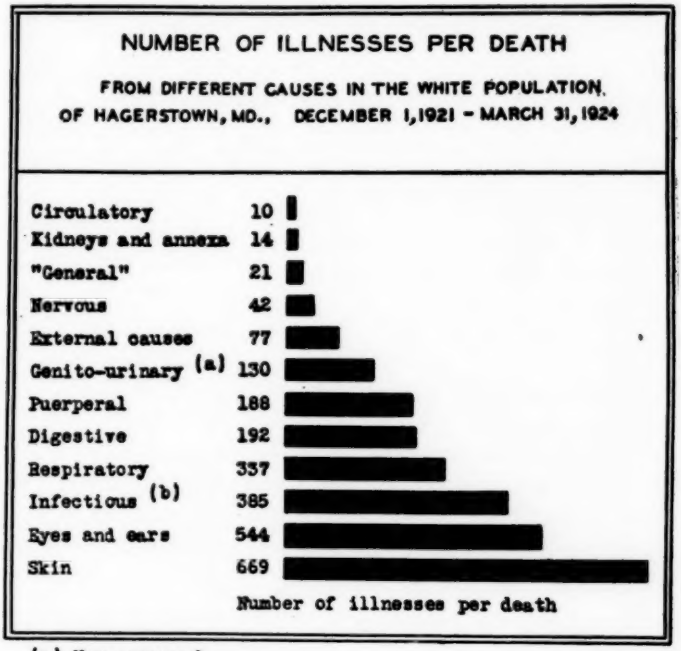
[Based on illness records for approximately 7,000 white persons of all ages, and death records for total white resident population, Dec. 1, 1921–Mar. 31, 1924]

Cause[1]	Annual rate per 1,000		Per cent. distribution, by cause	
	Illnesses	Deaths	Illnesses	Deaths
Diseases of respiratory system (11, 31, 97–107, 109)	672.3	1.995	60.0	19.8
Epidemic, endemic, and infectious (1–42, exc. 11, 31)	88.7	.230	7.9	2.3
General diseases (43–69)	23.1	1.118	2.1	11.1
Diseases of nervous system (70–84; part 205)	48.6	1.118	4.4	11.1
Diseases of eyes and ears (85–86)	23.4	.043	2.1	.4
Diseases of circulatory system (87–96)	24.0	2.410	2.1	23.9
Diseases of digestive system (110–127, 108; part 205)	110.2	.574	9.8	5.7
Diseases of kidneys and annexa (128–134)	14.4	1.062	1.3	10.5
Nonvenereal diseases of genito-urinary system (135–142)	13.0	.100	1.2	1.0
Puerperal conditions (143–150)	24.3	.129	2.2	1.3
Diseases of skin and cellular tissue (151–154; part 205)	19.4	.029	1.7	.3
External causes (165–203)	39.7	.516	3.5	5.1
Other and ill-defined (155–164; part 205)	19.3	.775	1.7	7.7

—is in sharp contrast to that given by mortality. Respiratory diseases and disorders account for 60 per cent. of illness as

[1] Numbers in parentheses refer to those given in the International List of Causes of Death, 1920.

FIG. 4



(a) Non-venereal.
(b) Epidemic, endemic, and infectious.

against about 20 per cent. of deaths; the general group of "epidemic, endemic and infectious" diseases account for 8 per cent. of illnesses, whereas only about 2 per cent. of the deaths were ascribable to this group; digestive diseases and disorders occasioned 10 per cent. of the illnesses as against 6 per cent. of the total mortality. On the other hand, the group of "general" diseases (which includes cancer), the diseases of the nervous and circulatory systems, and the diseases of the kidneys and annexa were relatively much more important causes of mortality than of morbidity. The diseases of the heart and circulatory system show the sharpest contrast; 24 per cent. of deaths are ascribed to these conditions as against only 2 per cent. of illnesses. In other words, these diseases manifest themselves relatively rarely in

definitely morbid effects, although they undoubtedly shorten life and make life less efficient and enjoyable while it lasts.

The prevalence and kinds of "chronic" conditions.—The prevalence of "chronic" conditions, as ascertained by a continuous series of observations upon the Hagerstown group, has a pertinent interest here. For details I shall refer to the accompanying table (Table 7), but some of the more frequent conditions may be mentioned. Of each 1,000 individuals on the average, 34 were affected with arthritis, lumbago and myalgia, 22 with neuralgia, neuritis and sciatica, 22 with neurasthenia, 21 with diseases of the heart, 7 with asthma and hay fever, 10 with chronic indigestion and other intestinal disorders, 10 with appendicitis, 7 with biliary calculi and calculi of the urinary passages, 7 with nephritis and 10 more with other kidney conditions, and so on.

The extent of medical service rendered.—We should not conclude this brief discussion without some consideration of the extent to which preventive, curative and relief activities of public health agencies, the medical profession and hospitals are dealing with the prevalence of disease. So many reports and volumes have been written upon the nature and scope of these activities, that it would be impossible even to summarize the salient facts. I venture to present, however, briefly, the results of a study from an entirely different angle, namely, *the extent to which a fairly typical population is actually the recipient of the services which these activities afford.*

That less than half of the illnesses recorded in the Hagerstown study were attended by physicians (Table 8) may be regarded in one sense as an understatement of the extent of medical services rendered because many of the illnesses recorded were mild cases that ordinarily do not require medical attention. It must be clearly understood, of course, that we are not speaking of "visits," but of *cases*; the number of visits per case was not ascertained, although for an adequate study of medical services it certainly would be a pertinent item for inquiry. Just what cases ought or ought not to have a physician is a question about which opinions will differ, and it was found that the proportion of cases attended varied with their nature (disease), discomfort,

TABLE 7

ILLNESS IN A GENERAL POPULATION GROUP

Prevalence of certain chronic conditions resulting in illnesses during a 28 months' period in a general population group in Hagerstown, Md.

Diseases or conditions (numbers in parentheses refer to those given in the International List of Causes of Death, 1920)	Rate per 1,000 individuals observed		
	Both sexes	Males	Females
Tuberculosis, pulmonary (31)	5.71	3.60	7.69
Tuberculosis, nonpulmonary (33–36)	1.28	.96	1.58
Venereal diseases (38–40)	3.61	1.44	5.65
Cancer (43–49)	2.33	.72	3.85
Tumors, benign (50)	.82	.48	1.13
Rheumatism (51–52)	28.65	20.16	36.64
Lumbago, myalgia, myositis (part of 158)	5.36	5.52	5.20
Rickets (56)	.47	.72	.23
Diabetes (57)	1.40	.48	2.26
Anemia (58)	1.51	.24	2.71
Goiter, exophthalmic (60a)	1.05	.24	1.81
Paralysis (75)	3.14	2.16	4.07
Epilepsy (78)	.93	1.44	.45
Chorea (81)	1.86	.96	2.71
Neuralgia (part of 82)	13.16	6.00	19.91
Neuritis and sciatica (part of 82)	8.62	3.84	13.12
Neurasthenia and nervous exhaustion (part of 84)	22.36	6.72	37.10
Diseases of eye (chronic) (85)	1.63	1.44	1.81
Diseases of the heart (87–90)	21.19	13.68	28.27
Arteriosclerosis (part of 91)	3.38	3.84	2.94
Hemorrhoids (part of 93)	2.10	2.16	2.04
Varicose veins and phlebitis (part of 93)	1.05	.72	1.36
High blood pressure (part of 96)	2.56	1.68	3.39
Asthma and hay fever (105, part of 107)	7.10	6.48	7.69
Ulcers of stomach and duodenum (111)	.93	1.44	.45
Chronic indigestion, constipation, and other stomach or intestinal conditions (112, 114, 119)	9.90	6.96	12.67
Intestinal parasites (116)	2.68	3.36	2.04
Appendicitis (117)	9.90	6.00	13.57
Hernia (118)	2.45	3.36	1.58
Biliary calculi and calculi of the urinary passages (123, 132)	6.64	3.36	9.73
Cholecystitis (part of 124)	2.79	.72	4.75
Unqualified and other liver conditions (part of 124)	3.26	2.16	4.30
Nephritis (acute and chronic) (128, 129)	6.99	6.00	7.92
Unqualified and other kidney conditions (131)	9.78	5.52	13.80
Diseases of bladder (133)	4.77	3.36	6.11
Diseases of male organs (135, 136)	1.40	2.88	.....
Chronic diseases of female genital organs (137–142)	8.15	.....	15.83
Menopause (part of 141)	4.31	.....	8.37
Congenital malformation (159–161)	1.78	1.20	2.27

TABLE 8

THE EXTENT OF MEDICAL AND HOSPITAL SERVICE IN A TYPICAL SMALL CITY

Per cent. of cases of illness, classified by broad groups according to cause, occurring in a white population group in Hagerstown, Md., which received medical and hospital care, Dec. 1, 1921–Mar. 31, 1924

Groups of causes (Numbers in parentheses refer to those in the International List of the Causes of Death, 1920)	Number of illnesses for which information was obtained	Per cent. with specified type of service	
		Attended by physician	In hospital[1]
All diseases	17,217	46	1.34
Diseases of the respiratory system (11, 31, 97–107, 109)[2]	10,461	34	.21
Epidemic, endemic, and infectious diseases (1–42, except 11 and 31)	1,423	61	.77
Other general diseases (43–69)	335	68	5.07
Diseases of nervous system (70–84, part of 205)	686	49	.87
Diseases of eyes and annexa (85)	119	61	.....
Diseases of ears and mastoid process (86)	175	64	5.14
Diseases of circulatory system (87–96)	287	83	1.74
Diseases and disorders of digestive system (110–127, part of 108 and 205)	1,555	58	4.05
Diseases of teeth and gums (part of 108)	118	59	.....
Diseases of kidney and annexa (128–134)	175	87	4.00
Nonvenereal diseases of genito-urinary system (135–142)	180	78	18.89
Confinement and other puerperal conditions (143–150)	390	98	3.59
Diseases of skin and cellular tissue (151–154, part of 205)	278	55	.36
Diseases of bones and organs of locomotion (155–158, part of 205)	103	64	5.83
Congenital malformations and infancy (159–163)	19	89	5.26
Senility (164)	11	64	.....
External causes (165–203)	638	73	1.57
Ill-defined and unknown	137	50	1.46

[1] Hospital cases included in per cent. "Attended by physician."

[2] Excluding 127 tonsillectomies and other operations (nonrespiratory) on throat and nasal fossae.

and severity. Thus, only 34 per cent. of respiratory attacks received medical attention as against over 80 per cent. of illnesses resulting from diseases of the nervous system and of the kidneys. If we omit "colds" and minor digestive disturbances, which numbered about 7,500 of the total cases recorded, we find that 65 per cent. of the remaining cases were attended by physicians.

TABLE 9

MEDICAL AND HOSPITAL SERVICE IN A TYPICAL SMALL CITY

Distribution, according to disease group, of illnesses receiving medical and hospital care in a white population group in Hagerstown, Md., December 1, 1921–March 31, 1924

Diseases (Numbers in parentheses refer to those in the International List of the Causes of Death, 1920)	Per cent. each disease group is of total	
	Attended by physician	In hospital[1]
All diseases	100.0	100.00
Diseases of the respiratory system (11, 31, 97–107, 109)	44.7	9.57
Diseases and disorders of the digestive system (110–127, pts. 108 and 205)	11.3	27.39
Epidemic, endemic, and infectious diseases (1–42, except 11 and 31)	10.9	4.78
External causes (165–203)	5.8	4.35
Confinements and other puerperal conditions (143–150)	4.8	6.09
Diseases of the nervous system (70–84, pt. 205)	4.2	2.61
Diseases of the circulatory system (87–96)	3.0	2.17
Other general diseases (43–69)	2.9	7.39
Diseases of skin and cellular tissue (151–154, pt. 205)	1.9	.43
Diseases of kidney and annexa (128–134)	1.9	3.04
Nonvenereal diseases of the genito-urinary system (135–142)	1.8	14.78
Tonsillectomy, adenoidectomy, and others[2]	1.6	9.57
Diseases of ear and mastoid process (86)	1.4	3.91
Diseases of eyes and annexa (85)	.91	.....
Diseases of teeth and gums (part of 108)	.88	.....
Ill-defined and unknown	.86	.87
Diseases of bones and organs of locomotion (155–158, part of 205)	.....	2.61
Congenital malformation and infancy (159–163)	.....	.43
Senility (164)	.....	.....

[1] Hospital cases included in per cent. "Attended by physician."

[2] Eight other operations on throat and nasal fossae included.

The distribution of the physician's cases according to condition or "cause."—Or, looking at the question of medical services rendered from the point of view of the physician (Table 9), we find that nearly half of the cases attended by physicians in a typical small city were respiratory attacks, 11 per cent. are diseases and disorders of the digestive system, and another 11 per cent. those diseases which are commonly grouped under the general heading "epidemic, endemic and infectious." Two-thirds of the physician's cases fall in these three classes—respiratory, digestive and infectious. About 6 per cent. are cases arising from "external causes," chiefly accidents, 5 per cent. are confinements and conditions incident to childbirth, and 4 per cent. are due to diseases and conditions of the nervous system. These results have been confirmed by the more recent morbidity reports obtained from physicians in a rural area by the New York State Department of Health. From these more extensive data for a half-year period, we may estimate that the average rural practitioner had about 1,020 cases per year (exclusive of communicable diseases) of which 316 were respiratory, 130 digestive disorders, 120 surgical and 47 gynecological, 76 neuroses, 75 tonsilitis, 47 heart diseases, 43 acute rheumatic fever and arthritis, 19 acute and chronic nephritis, 9 venereal, 6 diabetes, and 6 cancer.

Problems Yet Unsolved

It is hardly necessary to make any general observations upon the picture of disease prevalence which has been sketched so roughly, but I would like to reiterate two comments that, however obvious and trite they may be, gather importance as our particular kind of civilization develops.

The first is that public health has as yet barely touched the task of *preventing* the conditions which manifest themselves in physical and mental impairments, in inefficiency and illness, and in postponable death. Plagues and pestilences have been diminished, infant and child mortality from infections and intestinal disorders has been lessened, and healthful living is being established more and more firmly as a popular ideal, but aside from these the prevalence of disease remains as an outstanding problem as yet unsolved.

The second is that under the present organization of medicine this problem of disease prevalence is largely in the domain of private medicine. Speaking as an individual, I am inclined to believe that it ought to continue so if for no other reason that the personal relation between physician and patient is essential to effective medical practice, whether it be curative or preventive. But we can not shun, even if we choose, two exigencies. One is the development of *preventive* practice on the part of the physician if he continues to bear the responsibilities that the prevalence of disease imposes. The other is the economic problems involved, which I leave to Dr. Dublin to discuss.

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ABSTRACTS OF PAPERS DELIVERED AT SECTION MEETINGS

Section of Historical and Cultural Medicine
December 16, 1927

THE INFLUENCE OF HABIT IN THE EVOLUTION OF MAN AND THE GREAT APES*

HENRY FAIRFIELD OSBORN

In the study of human evolution, which has been an established principle ever since 1871, when Darwin published his classic work, we have now reached a period where many interesting new lines of inquiry converge: The fossil ancestry of man; the embryonic development of man; the comparative anatomy of man; the study of man in what may be called the higher aspects of modern anatomy. To-night I shall speak along the line of the conclusions drawn from these converging studies, but I must limit my subject to the influence of habit on human evolution and the bearing of that aspect of the subject on a burning question in anthropology to-day, namely, what kind of ancestors have we had?

Habit is king, and whether acquired adaptations are inherited or not, it is the destiny of all parts of the human body which do not serve a useful purpose to drop finally out of the scale and disappear. It is prolonged habit alone, after centuries and thousands of years, which determines the rise and decline of parts. Every great group of animals, including the anthropoid apes and man himself, tells this story. Man, particularly, moulds and modifies his form by his habits, his mode of living; different races of man, through prolonged and repeated choice

*The fifth in a series of papers on human evolution, the preceding four having been presented as follows: (1) "Fundamental Discoveries of the Last Decade in Human Evolution," New York Academy of Medicine, April 7, 1927; (2) "Recent Discoveries Relating to the Origin and Antiquity of Man," American Philosophical Society, April 28, 1927; (3) "Recent Discoveries in Human Evolution," Medical Society of the County of Kings, May 17, 1927; (4) "Recent Discoveries Relating to the Origin and Antiquity of Man," *Palaeobiologica*, Band 1, December 7, 1927.

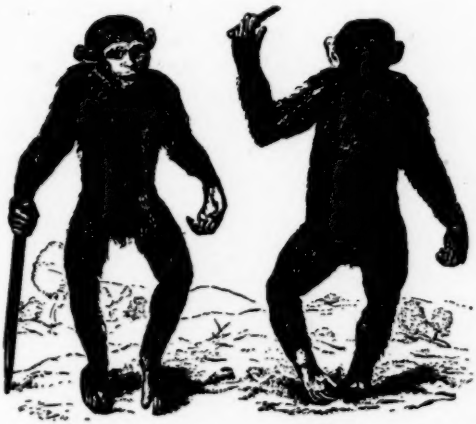

Fig. 1. Chimpanzee figured as a "Pygmie" by Tyson in 1699.

of one mode of life or another, mould their racial anatomy. For example, there is great contrast between the walking and the tree-climbing types, the running and the swimming types of man.

The group of men assembled here to-night to discuss this subject compose a society working in New York and throughout the country known as the Galton Society, named after Sir Francis Galton, cousin of Darwin; they are making their convergent researches in the greatest harmony, so that you will be disappointed if you expect to hear a discussion of the kind that took place between the Bishop of Oxford and Huxley, or in the famous Society of the Stanislaus described by Bret Harte, which, you will remember, ended by their throwing fossil bones around the room! Our discussions are entirely amicable; we understand that the emotional element should never enter into a scientific discussion or inquiry, nor should the personal element. The mind should be what Huxley described as a clear, cold engine of thought, without temperature. Consequently, although we are each deeply interested in our own aspect of the subject, we do not allow temper or temperament to modify our opinions.

In his "Descent of Man" Darwin, in 1871, gave a description, remarkable at the time, of his conception of our primate

ancestry. Like all of Darwin's writings, it is presented in a qualified way; I have not found in Darwin's works anything clearly specifying what kind of primate gave rise to man, whether lemur, monkey, or anthropoid ape. He leaves that question open, but he defines in an excellent way the character of our ancestral type and finally inclines toward the anthropoid ape. After Darwin's time, when his remarkable work was chal-

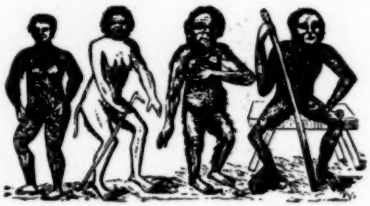

Fig. 2. The Anthropomorpha of Linnaeus. Left to right: *Troglodyta Bontii,* a fictitious "ourang-outang;" *Lucifer Aldrovandi,* an imaginary man-ape; *Satyrus Tulpii,* probably from the orang; *Pygmaeus Edwardii,* probably from the chimpanzee. Linnaeus knew nothing of the man-like apes but borrowed his views from his pupil Hoppius.

lenged, anatomists the world over were compelled to seek for evidence and to put their hands on the first evidence that could be found, so that it was in Huxley's "Origin of Man," published ten years after Darwin's work, in Haeckel's "Anthropogenie," and in subsequent writings, that the ancestral theory took more definite shape and scientific hypothesis began to concentrate on the anthropoid ape type as most closely resembling man. In their zeal, the resemblance was traced in every way, not only by anatomists away back toward the end of the eighteenth century —Buffon, Lamarck, those early Frenchmen of genius—but long before that by the natives who lived among the anthropoid apes of southern Asia and Africa.

Origin of the Ape-Man Myth

Thus there grew up a myth regarding these apes. Their resemblances to human beings were grossly exaggerated by travelers and explorers, and even by naturalists, and the growing feeling that the anthropoid ape gave rise to man has been

based partly on exaggerated reports of the habits and postures of these strange animals. This error is found even in the works of such a relatively cautious scientist as Haeckel. I myself was present at Cambridge University when Haeckel, coming for the last time before the public, visited the museum, took out of it all the anthropoid ape skeletons and a human skeleton, and before his learned audience raised them all alike into an erect position—an unintentional falsification of evidence.

From such supposed evidence as this and from figures like De Bry's of 1598 has arisen the popular, wholly unscientific

Fig. 3. One of the earliest representations of the simian or snub-nosed type, probably suggested by an early traveler who had seen an orang. After De Bry, 1598.

concept of the apes and gorillas as walking erect and even as capturing native women. We now know that apes do not stand erect, any more than do dogs or horses, except when they rear, as the gorilla does, in anger, and that a gorilla does not carry off negro women. Fremiet's sculpture illustrating this idea was a gift to the American Museum of Natural History, but it will never be exhibited, because in the Museum exhibits we are trying to present only truth and to eliminate all misrepresentations of ape and human resemblance. This false concept has also dominated the stage and literature, and I shall be glad to welcome the

day when the actual structure of apes is generally known and these vicious falsifications of natural history are corrected. A study of the tree-climbing or super-arboreal gibbon in motion shows him balancing himself with long fore limbs; he cannot walk in the quadrupedal position, because the fore limbs are so much longer than the hind limbs.

Travelers also represented these animals as extraordinarily human in shape; consequently, part of the accepted scientific

Fig. 4. Skeletons of anthropoid apes placed sub-erect in line with man in an entirely unnatural standing position by Haeckel. The gibbon alone, in walking and running, approaches this erect attitude. Left to right: gibbon, orang, chimpanzee, gorilla, man.

evidence is based upon misconception of their movements. Here again is the matter of habit. The structure of apes, like the structure of man, is an intensification and perfection of habit. In the recent researches of Professor Morton of Yale on the foot of the gorilla, it is shown that the baby gorilla is born with what might be called an arboreal type of foot, but that the adult gorilla, owing to his walking about on all fours, with his tremendous weight on his feet, gradually loses the distinctively gorilla type of foot; the big toe approximates the other toes, so that in the adult gorilla the foot is much more human-like than in the young gorilla.

New Anatomical Evidence

About three years ago I was a firm believer in the anthropoid ape theory of ancestry. I listened to a series of most able papers given by a number of investigators—Doctors Tilney, Morton,

McGregor, all members of the Galton Society—and felt then that by their investigations the anthropoid ape theory was quite established. A year later, however, I went into the central desert of Asia, in Mongolia; there I came under the influence of a new environment, a desert or semi-arid environment, and it flashed across my mind that this must have been the primitive home of man, that anthropoid apes could not have existed here. From that time to this the idea has been growing upon me, and last April, at the bicentenary meeting of the American Philosophical Society, I stated that I personally had abandoned the anthropoid ape theory and I advanced the opinion that man has a long line of Dawn Man ancestors and that the other theory rests upon a large amount of evidence which proves the *kinship* of anthropoid apes to man but does not prove the *ancestry of man through an anthropoid ape type.*

There is all the difference in the world between *kinship* and *ancestry.* When we come down to what we all believe in—to an anthropoid stem stock, a group from which both the anthropoid apes and man were derived—we get a neutral form which cannot be defined as either an anthropoid ape or man, but with that type, which has the potentiality of the human stock on the one hand and of the anthropoid ape stock on the other, we come to a parting of our ways, somewhere back in Oligocene time, millions of years ago.

Sir Arthur Keith, in his brilliant address before the British Association, widely published in the press, adheres to the older anthropoid ape view; he says: "All the evidence now at our disposal supports the conclusion that man has arisen . . . from an anthropoid ape not higher in the zoological scale than a chimpanzee." This question is therefore crystallized and presented afresh by one of the most distinguished living anthropologists, who with no uncertainty nails his colors to the anthropoid ape mast and impresses it by a graphic illustration. His chart (Fig. 5) illustrating his conception of man's origin* shows the branching off of the various types—the brachiating or limb-swinging type represented by the gibbon going off at the lowest point, then a stem from which branch human beings and the anthropoids (the orang, chimpanzee and gorilla).

*Keith: *Origin of Man,* p. 10. London, Watts & Co., 1927.

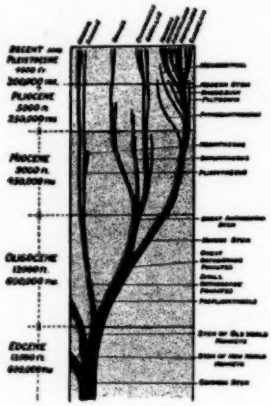

Fig. 5. Sir Arthur Keith's conception of the origin of man. The human stem (right) branches off from the great anthropoid stem (center); from a separate and much older anthropoid branch (left) the gibbon is given off.

In the family tree according to Gregory (Fig. 6) the anthropoid stock shows four branches (the four great apes) given off

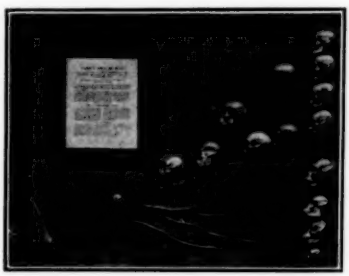

Fig. 6. Professor W. K. Gregory's well-known model (1924) in the American Museum of Natural History, in which *Dryopithecus* is placed on the same branch (upper) as the various fossil and recent human races. The gibbon (lowest branch) branches off at an earlier period from the simian anthropoid stock. This closely approaches Professor Osborn's theory (fig. 8).

from *Dryopithecus* (signifying "forest-ape"), and at the base the Trinil type and branches leading up to man. Morton's family tree (Fig. 7) gives early radiation of the ancestral primates

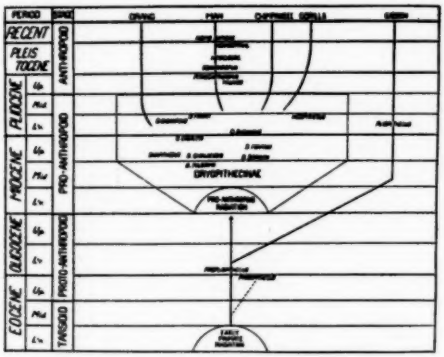

Fig. 7. Dr. Dudley J. Morton's conception of the relation of human and anthropoid stems as indicated by analysis of fossil teeth and their relative chronological position.

(lemurs, *Tarsius* and the proanthropoids) in Lower Miocene time, about the same geologic epoch as Keith's; here we find *Dryopithecus* or tree-living apes, with man in the center, the chimpanzee and gorilla at one side and the gibbon, the extreme arboreal type, at the other; this is again a theoretical concept of an arboreal anthropoid group from which man separates and begins his distinctively human career. My own chart of 1927 (Fig. 8) separates the human stock from the ape stock in Oligocene time, the ape stock going off by itself with *Dryopithecus*, in ascending order to arboreal types: gorilla, chimpanzee, orang, gibbon. Gregory's theory and Keith's differ from mine only in the fact that in the stem I separate very early the family of the *Hominidae* from the family of the *Simiidae*, to which the anthropoids belong. The differences set forth in these four charts are partly differences of opinion and of definition, but they are also differences of concept.

New Photographic Evidence

In trying to set forth and defend the reasons for my concept I am having recourse to photographs and moving pictures of living apes especially selected to illustrate the points of disagreement, namely, foetal comparison, limb structure and proportions, physiognomy, habits of locomotion and posture. The

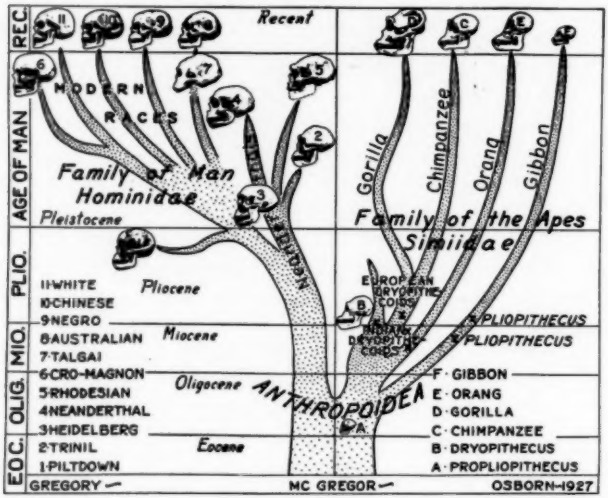

Fig. 8. The separate origin of the human (left) and anthropoid (right) stocks from a common pro-man and pro-ape stage in Oligocene time. After Osborn, 1927.

problem can be studied more clearly by examination of these photographs both of human beings and of anthropoids. The photographic material has been brought together by The New York Zoological Park, particularly through the efforts of Curator Ditmars in securing moving pictures, and by the American Museum. I doubt if there is any city in the world richer than New York in material for research, and the combined work of these two institutions has made New York one of the chief centers of research in this fascinating problem of human evolution.

I shall begin with the motions of the anthropoid apes and try to show through four series of lantern slides the characteristics of each of the types, in descending scale from the tree tops—the gibbon, the orang, the chimpanzee, which is partly arboreal and partly terrestrial, and the gorilla, which becomes so large and powerful and so capable of self-defense that the

Fig. 9. Native Burmese boy and gibbon, showing wide difference in limb proportion, the gibbon with long arms, the boy with short, slender arms. Scene from "Chang," a Paramount photoplay.

males at least live chiefly on the ground, although the females and young still resort to trees for protection. The anthropoid apes originally sought the trees, as did the monkeys and the lemurs, for defensive purposes. In the final series of slides, however, will be shown the developmental embryonic, phylogenetic aspect of the subject, the result of the remarkable studies of Dr. Adolph Schultz.

The matter of limb proportion is of especial interest and is being carefully worked out in a series of ratios and indices by Gregory and Shapiro, in collaboration. In the chimpanzee the outstretched arms greatly exceed the height, whereas man can stretch his arms only to the limit of his height. This disparity

varies, from the hyper-arboreal, tree-living stage down to the ground-living stage: there is less disparity between the fore and hind limbs of the orang than of the gibbon, and one photograph of a West African gorilla makes the limbs appear nearly equal, although in fact the fore limb is longer than the hind limb. The contrast in limb proportion between a native Burmese boy and

Fig. 10. Growth changes in human (white) hand and foot. After A. H. Schultz, 1926.

a gibbon is strikingly shown in the current photoplay "Chang." The long slender arms of the gibbon are his protection in his tree-living existence, enabling him to swing rapidly from branch to branch as his enemy pursues him.

Coming to the comparison of the hand and foot of the anthropoid apes with those of man, we find the apes with diminished, non-opposable thumb and elongated, hook-like fingers, and with enlarged big toe. To the tree-living gibbon, particularly, the thumb is utterly useless—in fact, a real danger—as he swings through the trees, grasping the branches with fingers held hook-wise, as the human trapeze performer supports himself; the thumb is still useful, however, in grasping food, and the thumb of the orang is more developed than is that of the gibbon, although the orang, too, is a tree-liver. The great toe is useful in tree life, helping the animal to support his body on either a

broad or narrow branch. In the Kivu Mountain region of Africa the gorilla foot more nearly resembles that of man, but even the detailed studies of Carl Akeley in this and other regions do not show the anthropoid apes as closely resembling man in other characters—in fact, they firmly establish the distinctions between man and the apes, even the gorilla, in several respects

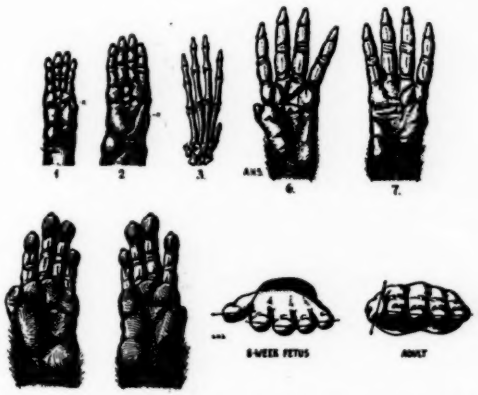

Fig. 11. Illustration of thumb reduction in the fully arboreal primates like the monkeys and lemurs (Nos. 1-7). Lower right: Separating fingers of the foetal human hand of the eighth week, and the adult hand with inturned thumb. After A. H. Schultz, 1926.

the highest type of ape. The gorilla's limbs are of nearly equal length, owing to the difference of position of the sockets of the respective bones; thus the back of the animal is nearly horizontal, though actually the fore limb is longer than the hind limb. The gorilla has only a rudimentary thumb, with which he holds the food, and a large big toe widely separated from the foot and the other toes, except in the Kivu gorilla above mentioned.

Of peculiar interest is the physiognomy of the anthropoid apes, in comparison with that of man. The face of the orang is most humorous, with its long upper lip, snub nose, from which the family name *Simiidae* is derived, prominent supra-orbital ridges, and retreating forehead. The chimpanzee has

a larger face than the orang, with smaller ears and less prominent eyebrow ridges. The brow ridges develop progressively with age: the young chimpanzee is practically without brow ridges, while the adult chimpanzee has this feature well developed, with consequent retreating forehead. This comparison is also made in the Neanderthal race of human beings; the Ne-

Fig. 12. Hands of gorilla, all reduced to same total length. Upper row: foetuses; lower row: adult *G. Gorilla*, after Hartmann (1880) and adult *G. beringei*, after Akeley (1923). *Memoirs Carnegie Museum*, Vol. XI, Pl. V.

anderthal brow ridges are feeble in infancy but prominently developed in the adult. In the matter of physiognomy the gorilla, in many respects least like man, in other respects most like man, also shows inequality of resemblance to human beings.

Tree-Climbing in Apes and Man

The anthropoid apes, owing to differences in limb structure and limb proportion, also to hand and foot formation, have entirely different habits of locomotion to man, particularly in climbing. The adult apes seldom climb a bare trunk, although certain apes and monkeys can shin a tree. A man shins up, with the soles of the foot turned in as they are in newborn infants.

In walking, the great apes take a quadrumanal position, progressing on the knuckles, not on the open palm of the hand as monkeys and other quadrupeds do. As has been pointed out, the apes rise to an erect position in defense, but come down again to their customary quadrupedal position.

Most enlightening are the extensive studies of Dr. Adolph Schultz in embryology, in which foetal characteristics in man

Fig. 13. A typical chimpanzee in the New York Zoological Park, with hand and foot placed close together to contrast the greatly reduced thumb (pollex) and enlarged big toe (hallux). After Ditmars, 1927.

and apes are compared; I think fifteen hundred human embryos have been examined by Dr. Schultz, and the result is a rare assemblage of unborn stages of the hand and foot, brought together for the first time, teaching in the main that man does not recapitulate the anthropoid ape type in individual development, except in certain characters. The embryo human hand is pro-human, not pro-ape. The embryo human foot is like that of monkeys and apes.

In the study of the influence of habit it is interesting to note certain types of man. The squatting type is exemplified by the tailor or shoemaker. Sir Arbuthnot Lane, in his great monograph on the influence of habit, carefully details the changes which the occupation of the tailor produces in his form and anatomy. The Hawaiian swimming type—Duke Kahonomoku, for instance—a race which takes to the water by instinct, is small waisted, broad chested, with broad shoulders and marvelous limb development. The running type, as studied in the Finn Nurmi, has a splendid chest, thorax and abdomen, feeble arms, but powerful legs. The ideal, well rounded human type is depicted by Tait McKenzie, the sculptor, whose well proportioned, well balanced statue of the ideal man is a composite of the measurements of a very large number of Harvard University students.

Science works by trial hypotheses. I have one hypothesis, my opponents have another. To my mind there is very strong evidence of the prolonged independent ancestry of man, an ancestry not of anthropoid ape type, but of a neutral, common type. I agree to many arboreal traces in human descent, but I dissent as to the geologic length of arboreal life which my opponents claim resulted in resemblance between apes and man; I dissent as to our ancestry from a type which had specialized as far in arboreal life as the anthropoid ape. My theoretic ancestor belongs to a pro-ape stage, which I call the Dawn Man line. But we are all keeping our minds open; only in that way can we get at the truth.

DISCUSSION

Dr. Raymond L. Ditmars: The gorilla. In Elliot's monograph six races are recognized; that is, a species with six sub-species. This is a young specimen about five or six years old, or approximately that. It is difficult to gauge the exact age. It was brought from Africa by the late Mr. Garner. Interested in toys and curiously enough in pets! An interesting reaction here when the doll is taken from her.

One interesting thing was that these small animals, rabbits, guinea-pigs and young dogs, appeared to be fond of the gorilla.

The chimpanzee. We are showing on this reel the four types

of anthropoid apes—we will call them types, because we realize that with the gorilla there are several races indicated, that is, six sub-species. With the chimpanzee, Elliot recognizes eleven distinct species.

This specimen at the time the film was prepared was about six years old. A comparison. The chimpanzee and the orang-utan. The orang on your right. This is an interesting study of ears. The ear of the chimpanzee is proportionately much larger than that of the orang-utan.

The interesting gait of the orang-utan as described by Professor Osborn, a walk upon feet and knuckles. It is well to bear that in mind. Later in this reel we will repeat that same view in a comparative way.

The orang, the third type of this group. A young specimen, a young male in fact, and at about the age of eight or nine years. Here the habit of placing leaves upon the head. This is actually a protection of the head against the heat of the sun. You might say a very crude type of sunbonnet.

At the age of about eight or nine years a ridge-like development is indicated around the face, and with a very old male is greatly pronounced. An interesting comparison of the gorilla and the orang-utan, and here again we note that great difference in the size of the ears.

The skin texture of the hands of anthropoid apes is more similar to the human than that of the monkey. In fact, there are parallelogramic lines. Here is an illustration of the difference of the thumb of the orang-utan and the well-developed member of the human hand.

While these things may appear a bit humorous, we have selected an opaque bottle to study a bit of psychology, in fact, to see how he will note the depth of the falling tide in that bottle. The scene is particularly interesting owing to the use of the thumb and after Professor Osborn's description of the shortened thumb, it would be well to glance occasionally toward the hand instead of studying the orang's body. Note the movements of that long hand. The scene indicates an average bit of orang psychology. No instinct prompts actions of this type. Here again we see that the thumb is a clumsy member. That

jacket is actually clawed away by the long fingers, in fact, grasped by the long fingers. Very clumsy and very crude in their manipulation.

The gibbon is the fourth type of anthropoid ape. Twelve species of gibbons are recognized, this being a very black species. This is one of the smaller species, although they are of fairly uniform size. It is able to run erect owing to the balance of those excessively long—we might say in considering these species—arms or fore limbs, but the gibbon is the only anthropoid ape type that is able to progress in nimble fashion in that position.

Just for the moment comparing a mere monkey with the anthropoid apes. Quite a crude type as regards mentality and its general actions as compared to those higher types. Incidentally, an Old World monkey and illustrating the use of the cheek pouches in storing the food. Cheek pouches are not indicated among any of the New York monkeys nor does the prehensile tail exist among Old World species.

Here we have come back to the anthropoid apes again, and we have purposely selected some newly-arrived specimens that are not trained, that are not accustomed to crowds and captivity, that have had but little observation and we are noting reaction after several experiments. These are very young specimens, possibly two and three years old, respectively. There is the gait again—on the knuckles and the feet. Sometimes in a hurry, in rather an incongruous way. Here also the affection for the sympathetic keeper. That is a man with whom the animal has immediately become friendly after a few hours contact.

Here is a comparison between two, three and five year old orang-utans. An experiment with these younger specimens. Nearby is a quiet spot and we will note the reaction after an examination of some ordinary toys.

Fear for the moment, but curiosity soon overcomes fear. These babies are but mildly interested.

There is one thing an orang will do. That is to imitate the method of human eating—and he is curious. It is difficult to get him to use a cup when the spout of the tea-pot appears to be so handy.

We are repeating that scene of the orang upon feet and knuckles. On account of his short legs and his long arms that position is natural and easy, but now note the difficulty with the human. These scenes were prepared at the suggestion of Professor Osborn. Note the great difference between these postures and those of the anthropoid apes. These boys are doing their best. We will follow this immediately with an ape again.

Now we have a good illustration of his short legs and long arms and easy position.

Dr. W. Reid Blair: It has been a very great pleasure to have had the privilege of hearing Professor Osborn discuss the influence of habit in the evolution of man and of the great apes. If Professor Osborn had not chosen to become a great paleontologist he might have become a very great physician, because he has that very happy and great faculty of weighing and taking note of negative facts, and we all realize that a physician needs to consider the negative instances as well as positive symptoms in making a correct diagnosis.

Man is often spoken of as the thinking animal, as if he were the only creature to possess the power of flooding the present situation with past experiences. Man has the highest intelligence because he has the greatest wants and the greatest mobility. Beings, without wants, could very well do without mind. The reason why animals have intelligence and plants none is that animals move about for their food while plants take what comes to them.

Professor Osborn has very well brought out that the cultivation of skill with the hands and fingers was probably the greatest stimulus to man's mental supremacy. And educators to-day have pretty well demonstrated that one of the best methods of developing the mind of the child is by insisting upon the constant use of the hands.

In remote times the earliest true men had probably simple minds, but perhaps one should not be too quick to assume to underrate intelligence even of primitive man.

However, the struggle for existence, which included defense, hunting and the building of homes and many other conditions, must have led to a great development of the cerebral functions; and migrations brought them under the influence of varied climatic conditions which, no doubt, influenced the central nervous system in no small degree.

It is well known how powerful is the force of habit in the very young. For instance, if a new born animal like the lion cub is allowed to suckle its mother only for a single day, it is much more difficult to rear it by hand. Perhaps the highest faculty man possesses is that by which he generalizes and forms conceptions of the abstract, and yet animals are not wholly without a semblance even of this faculty. That animals have intelligence or the power to conjure up pictures of absent ones is well illustrated by the grief of the dog at the absence of its master, and by the capacity of animals to dream. The small boy who owns a dog is not prone to slur the intelligence of his pet, for he talks to him, plays with him, imputes motives to him, and praises him as if the dog's thoughts and feelings were a counterpart of his own.

If we have an animal, for instance, like one of the anthropoid apes which was shown here to-night, exhibiting marked expressions of affection, sympathy, jealousy, or rage, can we doubt the analogy of the mental experience behind them to the feelings similarly manifested by man?

The higher animals possess and display the same fundamental passions and emotions that animate the human race, and these passions and emotions are readily recognized even by the ordinary observer. I have known a young chimpanzee made jealous when her keeper caressed an orang, to uncover her teeth, and with a peevish whine turn her back on him. I have seen a chimpanzee in a violent passion present a curious resemblance to a child in the same state. She screamed loudly with widely opened mouth and with the lips retracted so that the teeth were fully exposed. It is not unusual for the anthropoid ape confined for any length of time to become aware of his attractiveness and not infrequently to regard a cage mate with jealousy if this companion should attempt to trespass upon its own popularity. The chimpanzee is the most intelligent of all animals

below man. His mind approaches more closely to that of man and carries him farther upward toward the human level. He can learn more by training and learn more readily than any other animal. If the chimpanzee could have had the same advantages of culture, for the same number of years that the domestic dog has enjoyed for thousands of years in his association with man, we might today be witnessing a remarkable intellectual development in this animal.

It has long been my ambition to secure for the Zoological Park a building suitable for housing a collection of the anthropoid apes, where these highly intelligent animals could be studied by noted psychologists, and where definite information relative to reproduction might be obtained. I believe that a great deal of valuable data could be obtained through the observation and study of their mental traits and especially their capacities for solving simple problems. The psychologist would find a wide scope for his highly philosophical work in the study of the mentality of the anthropoid apes since they exhibit considerable differences in high function and offer a good foundation for the study of the more complex activities of the human mind.

Dr. Tilney: Many of us who speak in the discussion tonight are the ardent disciples or pupils of Professor Osborn. We recognize in him the outstanding figure in this broad field of human inquiry. Like the rest of the world we listen with the utmost respect to what he has to say and we find ourselves particularly in this attitude in his latest pronouncements concerning the evolution of man. It might seem presumptious even for us to question in the slightest degree any of his recent opinions and if we seem to do so, we wish it clearly understood that we use the utmost reservation wherever our ideas seem to be in conflict with his.

I should like to give the evidence of the brain as bearing upon this problem. In doing so I find myself in the position in which I am totally unable to displace the honored anthropoid from his well-recognized position in the ancestral line of man.

Professor Osborn has dwelt largely upon what we may consider a late phase, the primate phase in evolution. I would like

to call your attention to certain phases that long antedate that, with the idea that unless such a long review is made, certain important factors in man's evolving may be overlooked.

I should, in fact, like to go back to the time when the mammal was first beginning to emerge from a reptilian stage, 135,000,000 years ago. Now, through all this enormous period of time there was one dominant keynote that was operating, in my judgment, upon the development in all respects, behavior and structure of the mammal and this keynote brought forth a new power that was not possessed by any of the vertebrates below the mammal. I have already tried to describe this power which is technically known as *neokinesis*. It is a new power of motor expression by means of which the mammal far transcends any of the lower vertebrates and which finally leads up to those extensive skilled acts which we see in man, which have produced his powers of speech and all the multitudinous performances of his hand by means of which he has conquered the earth and the air around it.

This marvelous new power of motor expression caused a structural change that was equally remarkable. It called into existence a new part of the brain, a part of the brain which had never existed before until the mammal made its appearance upon the earth. This new part of the brain we call the neopallium. It is more generally known as the cerebral cortex. What humanity is to-day and what it is not, is directly attributable to this portion of the nervous system. And it was not attained by any short or slow process. It came through great and devious way of development.

I believe that perhaps the most impelling motive which determined the development of this new part of the brain was arboreal habit, that is to say, living in the trees was the most important factor in bringing this new part of the brain up to its highest development.

If you consider all of the mammals which have lived, those which are extant now and those which are extinct, the great multitude of them all, it is perfectly clear although they all possess this remarkable new power of the brain, very few, if any of them, made much headway with it. But finally, some of

them, which we know as the primates, for one reason or another, were forced to take to the trees and there to live more or less permanently; and as a result of this arboreal life great changes began to take place, particularly great changes in the master organ of life, the brain.

I would like to show you some illustrations of how, from the earliest time when these mammals, the primates, took to the trees, the great steps forward were made.

This illustration, which was prepared for Professor Osborn and which he very kindly has allowed me to use, shows all of these points. Here we note the lowest horizon of primate organization when they first began to take to the trees as the lemurs and tarsius. Then later the mycetes and the macacus and the baboon. The gradual extension of the neopallium is carried on until we reach the anthropoid horizon. Finally in the human we find every area of the brain represented which was represented at the lower levels, all having undergone great expansion, which is consummated in the frontal lobe, especially in Broca's area, the area of speech, which has given man a transcendent advantage over all other animals.

These facts may be demonstrated by measure. I therefore prepared certain indices of the brain which show not only the structural advances in the pallium but its functional advances as well. In animals with wings, fins and paddles, such as fish, birds, reptiles and amphibia, the forebrain index is the lowest, increasing in proportion in animals with paws, hoofs and claws, such as dogs, bears and horses, and finally reaches its highest value in animals characterized by hands, fingers and fingernails. These animals are represented by the primates, including lemurs, monkeys, apes and man.

The notable expansion which takes place in this part of the brain is seen in the frontal lobe, that area of the brain necessary to all our higher judgments and to the development of personality. Measurements clearly show that starting with a low mammal, like the anteater, with nine per cent., we pass through all gradations to the greater expansion of man with forty-seven per cent. in his brain area of the frontal region.

It is not merely in these external appearances of the brain that these signs of evolutionary advance may be detected. I

have studied a number of these interval details and list here a few of them and also show in actual cross section and reconstruction some of these facts which indicate the unfolding that is taking place in the brain among the primates.

This body which I will show now is the inferior olivary body. It has to do with the coordination of eye, head and hand movements. In passing from the low mammals to the primates a great expansion takes place. At the same time another structure, a bundle of fibers which carries all motor expressions from the forebrain down to the levels of the spinal cord shows a similar expansion. So these two features in the brain are notable as showing this evolutionary development.

Graphic representations of these structures show the progressive development of the pyramid and olive. Immediately tree life is assumed and the primate order is well defined, reaching its highest development in man. The cerebral peduncle represents the main concentrated output of the cerebral hemisphere (the cortex). Here is shown the repetition of that advance in development when arboreal life was assumed, with a slight falling back in tarsius. But the question of tarsius is a debated one and probably this animal represents a form which stands at the lowest extremity of the primate order.

These types clearly indicate that a definite evolutional process has been carried on in the brain and that its main incentive has been, as far as the primates are concerned, tree life (arborealism). That the effects of arborealism are clearly seen in the lowest of the primates, in the lemurs and tarsius and then they are seen in the intermediate primates, the baboons and the macacus monkeys, up to the preanthropoid stage as represented by gibbons.

Professor Osborn called your attention to the activities of the gibbon. I believe that any one who has seen the picture "Chang" and the white gibbon in that picture, will agree that gibbon is able to stand upright and walk and run. The factor which I think has played an important part in bringing about this erect posture is the brachiation which the gibbon is compelled to employ in its ordinary tree locomotion; that is swinging by the long arms from branch to branch. This factor of brachiation has not been a small one in developing the upright

posture. In a word, I believe arboreal life has played a tremendous part in the development of the human brain and we clearly see in human organization the effects of past arborealism. That, of course, means that man has passed through an anthropoid stage and that he has had a line of proanthropoid, prohuman ancestors among the primates.

ORIGIN OF HUMAN LIMB PROPORTIONS THROUGH CHANGE OF FUNCTION

Professor William K. Gregory: In opening the subject I can do no better than most cordially endorse the sentiments which Professor Tilney has just brought forward. I myself owe my introduction to the study of evolution and a very great part of my opportunities to study it, as well as a grounding in the principles of evolution, to our honored chief, Professor Osborn. And I wish first to bring out a few things that I learned in his course in vertebrate morphology a generation or so ago, but which I believe are very firmly grounded, and just as good to-day as the day in which these principles were taught to me. The first principle that I wish to speak of is the principle of the change of function. Here you see a figure of a seal and it takes only a slight inspection of the hands and feet of the seal, that is of its flippers, to see that those are hands and feet that have been covered, as it were, with gloves or mittens. One will have no difficulty in inferring from the anatomy of the seal and from the form of the skeleton that the seal is a made-over land animal which has suffered a great change of function.

Now with that change of function has come a profound change in proportions, in the relative lengths of the different parts one to the other. I was taught by Professor Osborn to believe that what he calls allometrons or proportions were not fixed, eternal things, laid down once for all and delivered to us, but that they were subject to change in the course of evolution; the seal gives you a splendid example of a thorough-going modification in proportions, especially in the limbs. In fact the limbs are particularly plastic in their changes of proportions. The seal is derived, we believe, from animals that progressed on all fours, like dogs, and their feet have undergone great enlargement while the proximal segments of the limbs are greatly shortened.

This slide will show you a paleontological example of a very profound change in the proportions of the limbs. It is a fossil whale in which the fore limbs have been entirely made over for life in the water, so that their proportions are utterly changed in every bone from that of the terrestrial ancestors. Here in the hind limb we see the reduction of the normal hind limbs. There are still the elements of the pelvis and the femur and the tibia, but they are greatly reduced, so that this change in function involves a diminution of some parts and an increase of others. In other words, we witness secondary alterations in the proportions of the limbs following upon change of habit.

This slide will give you another example which was worked out by another pupil of Professor Osborn's, Professor Bensley, of the University of Toronto. It shows the change in the proportion of the digits of the feet, assumed in the passage from a tree-living, grasping type of foot, seen at the left, to an extreme terrestrial, hopping type of foot, seen at the right.

These Australian mammals are what are called bandecoots, and they are all terrestrial in habit except the one at the extreme left, which is a tree-living member of the same order. Here you will see that the digits profoundly changed their proportions when arboreal life was changed to terrestrial life. The fourth digit of the hind foot became greatly enlarged. In this case the first digit of the foot, which is strongly divergent in the tree-living type, dwindles away and finally disappears.

This figure shows you what I believe to have been a profound change in the proportions of the digits in passing from the arboreal stage in primates to the terrestrial stage. In the lowest figure we have a primitive arboreal mammal such as Professor Osborn mentioned in one of his slides, which was taken by Dr. Matthew to be the starting point of all the placental mammals. It is a short grasping foot with a divergent first toe. In the second figure you have the oldest known foot of a primate. It is from the lower Pliocene of Wyoming and it is according to modern estimates about forty to fifty millions of years in age. That foot, together with other evidence, indicates that at that remote epoch the primates were thoroughly arboreal animals. They had the arboreal stamp deeply imprinted on every bone of the locomotor skeleton. They al-

ready had feet capable of grasping the branches, and they already had the characteristics that all primates down to man have, of flat nails, particularly on the first toe of the hind foot. That flat nail on the great toe is present in all primates up to and including man. In these intermediate forms you see how the great toe greatly increased in size (as I interpret the evidence), in the shift from the arboreal mode of life. In the terrestrial mode of life there was a profound change of proportions in the length of the digits, of such a nature that the great toe, being already the dominant element of the foot, increased still further and became the main anchor of the foot. The other toes had already begun to shorten, as we see in this baby gorilla, and that process of the shortening of the other toes is carried to an extreme in man.

But you will also see that in this feature the gorilla is structurally intermediate between man and the other primates, in respect to the shortening of its digits. That is, the other digits are shorter in proportion to the length of the foot as a whole. Also the gorilla first among the primates shows the development of the heel in a downward direction, so that it became a great supporting element in standing.

These figures are drawn to different scales. The left is Professor Schulz's outline based on X-ray examination of the fetal foot of the ninth week, and the right is the adult human foot. The bones from the X-ray pictures show that the first digit, according to him, at that stage is remarkably divergent. I hardly want any more completely arboreal foot to start from than that.

Here we have a comparison of the fore arm as a whole, the bones of the fore arm in a chimpanzee and two human stages. One is a Vedda, after the cousins Sarasin, and the other a European. We can see these are quantitative differences, not qualitative differences, between the skeletons of these three types. They are quantitative differencs only. Qualitatively, they are the same. They have the same elements, only they are differently proportioned.

I was originally taught, and I still believe it profoundly, that proportions, like everything else living in the universe, have changed and changed profoundly. The excessively abbreviated

length of the digits in the adult man I believe is a secondary change of proportion, as well as the enlargement of the thumb. I infer that the thumb is a progressive member in man which has enjoyed an enlargement comparable to that of the great toe on the hind foot, on account of its increasing importance in function, and I entirely subscribe to the doctrine that "habit is king" in this matter of proportions.

I think this slide has already been shown you by Professor Osborn. It is Professor Schulz's contrast of the fetal stages with the adults of anthropoid apes and man. Now of course the fetal stages differ from each other, but they differ from each other less than the adult stages do. Sir Arthur Keith and others have pointed out that that is the way a great many new characters appear in the differentiation of new forms. They first appear in the fetal stages and they become more and more pronounced as growth proceeds. You will see in this series that the chimpanzee and the gorilla differ from the human fetus only in comparatively slight changes of proportion. Nothing nearly so profound as the difference between the length of the feet in the seals and that of their terrestrial forbears. In other words, I feel that Professor Schulz's evidence lends very strong support to the exceedingly close kinship of man and the anthropoid apes and points to the separation of the two at a moderate geological distance, perhaps in the Oligocene as Professor Osborn suggests.

Professor Dudley J. Morton: Probably the most fortunate element of this occasion lies in the opportunity it affords of reiterating a statement of the relative position and importance of the two problems, 1) Human Evolution and 2) the point of origin of the human stock.

Human Evolution represents the major problem of man's origin and development in its broadest scope. The question as to when and where the human stem began is an issue of relatively minor importance—a matter of detail. Too frequently, controversy within our ranks is interpreted on the outside as an actual refutation of Human Evolution on the part of certain of our members, or at least that our convictions have rather

insecure foundation. Therefore, in an open meeting of this sort, it would seem desirable to repeat and clearly to define the position of the two problems.

Your visitor from out of town need not disturb himself unduly as to whether Fifth Avenue and Broadway bifurcate at 14th, 23rd, or 34th Streets, until after he gets here. Then is the time for him to worry about such details!

By painstaking efforts, evidence has been gathered which demonstrates to us unanimously and in an unmistakable manner, that man is a product of Organic Evolution. We feel, then, like your lately-arrived visitor, that we have reached the big city. Give us time and we will become acquainted with the lay-out of the streets!

To-night an interpretation of the evidence as to where the human stock originated has been presented by our speaker, Professor Osborn, whom all of us esteem most highly. He has manifested an admirable quality of sportsmanship and fair-mindedness, in inviting some of us whom he knew to hold views differing from his own, to hear and discuss his talk. Such a diversity of views is usually the result of different lines of approach to the study of a problem; and the exchange of different interpretations should prove helpful and constructive rather than disturbing.

Since several viewpoints are being offered here, I would like briefly to give a somewhat graphic idea of the aspect from which I have approached the problem of Human Origin—that of Comparative Anatomy. For example, let us use three points: The first point (at the bottom of our blackboard) represents the earliest phase of primate life, occurring near the beginning of the Eocene period. This upper point 2 (to your right) represents modern anthropoid development. And point 3 (on the upper left side) represents the modern physical structures of mankind.

Because the living great apes have been derived from the primitive tarsioid forms represented by point 1, a line connecting points 1 and 2 may be used to indicate the course of anthropoid evolution. A similar contact must be made between points 1 and 3, as man also is a primate derived from the same

root; but here the question arises—Does this second line connect these points directly, or does it converge upon our first line? If the latter is the case, then how far after the first line (anthropoid) has departed from the original point 1, does it form the fork branching to point 3 (man)?

When we compare the body-structures of modern man with those of the very primitive tarsioid, a very wide range of anatomical differences is to be observed. The ancient tarsioid was a small quadruped; man is an upright biped. Consequently many changes were necessary in order to create man, and those changes extend throughout the entire body. They include changes throughout the skull and a change in the relationship of the head to the spinal column. (The lower jaw of a quadruped is carried practically on a line with the direction of the spine, both being horizontal.) Also there is a change in the ordinary movements of the neck. In the quadruped the head swings to the right or left upon the neck, while in man the head moves by a rotation of the neck.

Man has decidedly longer arms than the primitive quadrupedal tarsioid. We find also very marked changes in the shoulder joints. The shoulder joints of a quadruped are more or less restricted to a single plane of movement in the direction of locomotion, while man has the ability to move the arm in all directions—circumduction. There is a notable lateral widening of the chest in man, the inclusion of a rudimentary tail in the floor of the pelvis, and a readjustment of all the visceral structures—changes which are definite and specific rearrangements for the erect posture.

The legs of man have been changed to extend in a direction continuous with that of the spine, instead of being at right angles to it as in the quadrupeds. The human foot is far different from that of the early tarsioid.

If we analyze these many differences and their nature, we will recognize that to a large degree they are identical with the characteristic changes by which the body structure of the great apes has also become differentiated from that of the distantly ancestral tarsioids. In observing the various habits of animal life—and here is an example of how comparative anatomy and

natural history are combined in these studies—we note a locomotive habit peculiar to the anthropoid apes—they move about in the trees by means of the arms as a man swings on a trapeze or traveling-rings in a gymnasium. Such a habit (brachiation) if adopted by a quadruped, would alter completely the body posture of the animal. Moreover, it would have specific influence to encourage and to stimulate the entire range of changes for a vertical position of the body, such as characterizes both the human and the anthropoid groups. Arboreal brachiation imposes a transfer of the function of locomotion from all four of the legs to the upper extremities only, with a subsequent increased development and greater mobility of the shoulders, longer and more powerful arms; and the legs would tend to become extended in line with the vertical body through the unrelenting influence of gravity. In fact, it is in the altered relationship of the body structures with the downward pull of gravity (as effected by the horizontal or the vertical position of the animal) that we can find a uniformly constant explanatory basis for the structural differences, especially of a mechanical nature, which man and the apes hold in common to the primitive quadrupedal tarsioid.

The grasping foot of the great apes traces back to the type of foot which we assign to the early primates and to the lower modern forms, without any obstacles to that conclusion. The foot of man, however, has not come directly from such a source, for analysis has demonstrated in no uncertain manner, that the human foot could only have been evolved from a grasping anthropoid model.

In considering the teeth, we are dealing with evidence of utmost importance in my opinion, because this phase is supplied with actual fossil material. Professor Gregory has shown in his extensive studies, that the Miocene ancestors of the great apes possessed a tooth pattern which, while far removed from that of the ancient tarsioids, stands midway between the dentition of the anthropoids on one side, and of man on the other. Hence, in the tooth structure of the Miocene apes—a group I prefer to regard as "proanthropoids"—we have evidence that apparently furnishes us with an actual point of contact or union between the ancestral human and great ape stems.

Prof. Tilney has emphasized the importance of "arboreal brachiation" as a necessary phenomenon in the evolution of the human brain. It was also the outstanding factor in altering the ancient quadrupedal primate to the point where, by the adoption of ground-living habits, its body was prepared to begin assuming the distinctive physical characteristics of mankind. In other words, a long, protracted period of brachiating habits in the trees was required to modify and establish the body structures and nervous system of the primitive quadruped for the upright posture, and to extend the legs below a vertical spine. When this had been accomplished to a sufficient degree, the prehuman stock descended to the ground as erect bipeds with a gait probably not unlike that of the modern gibbon. In that adoption of ground-living habits, the function of locomotion became completely transferred from the upper extremities upon the legs with the subsequent increase in their size and development which we now see in man. The other groups remaining in the trees as ancestors of the living apes, continued to acquire greater and more exaggerated arm proportions, lengthened and hook-like fingers, and a notable reduction in the size of the thumbs. Man's relative arm-length may be regarded as representing the stage of arm development attained when his original ancestors began their life on the ground.

As we review our comparison of the body structure of man, of the anthropoids, and of the primitive quadrupedal tarsioid, it becomes strikingly obvious that in retracing human anatomical characters, we find them converging—not upon the little tarsioid form—but upon some point in the line of anthropoid evolution. Hence, the problem of where the point of origin of the human stock is to be located, seems to resolve itself into two questions,—1. How long were tree-living habits maintained by the evolutionary line leading to mankind before its representatives turned to life upon the ground? 2. Was the early arboreal existence of the prehuman stem separate from that of the ancient anthropoid stock as an example of similar habits with parallel development; or were the two lines represented in a single ancestral stock—and if so, for how long?

Answer to Question 1: The degree (estimated quantitatively) in which man's anatomical structures have departed from those

of the primitive tarsioid by adaptations for the vertical carriage of the body, and the degree in which they concur with similar changes observable in the bodies of the apes, indicate 1,—that the prehuman period of arboreal existence must have reached fully half of the chronological distance from the beginning of primate life to the present time; and 2,—that the peculiarly human physical characteristics of mankind are essentially terrestrial adaptations for bipedism which have been superimposed upon, and have modified the distinctive arboreal characteristics that had been attained to a relatively high degree both by the ancestors of man and by the ancestors of the modern anthropoid apes.

Answer to Question 2: That the prehuman period of arboreal existence with its associated adaptations for an arboreal erect posture (brachiation) is to be represented in a single or common ancestry with the great apes, is strongly testified to by the following evidence:

1. The intermediate position of the Miocene apes' dental pattern which has been retained to a definite degree by living anthropoids, and is also recognizable in the tooth structure of fossil man.

2. The similarity of brain organization in human beings and in the anthropoid apes.

3. The fact that the human foot could only have been evolved from a distinctly great ape grasping type of foot.

4. Physiological blood tests, which demonstrate the exclusively close relationship of man and the apes, as compared with the remote relationship man holds with all other primates upon the basis of similar tests.

5. The absence of any basic anatomical or physiological differences which would affirm the early separation of the human and anthropoid lines of ancestry.

Combining all the reasons just given, it seems most logical to conclude: a) That the human stock originated from "proanthropoid" ancestors at some point within the early half of the Miocene period; b) that the separation of the two stocks occurred when as erect bipeds, the earliest representatives of the human stem began their life on the ground; and finally, that the

actual development of a recognizably human body form (through terrestrial modifications of the original proanthropoid structures) could hardly have been effected until far into the long Pliocene period which followed.

Professor J. H. McGregor: Many years ago the great zoologist Huxley said that the question of questions in interest to mankind was the problem of human origin and man's place in nature. I have always felt very sympathetic toward this view and for many years have been particularly interested in this question, especially the relationship of man to the anthropoid apes and other primates.

Like Professor Gregory, I am glad to acknowledge my great indebtedness to the excellent training in zoology which I had under Dr. Osborn many years ago. Much as I admire Professor Osborn and in agreement with him as I am on most zoological questions, I am unable to follow him in deriving man and the living anthropoid apes from separate stocks which diverged earlier than the earliest fossil anthropoids. The evidence from comparative anatomy, paleontology, embryology, biochemistry and even comparative psychology, indicates beyond any doubt, to my mind, that man and the modern anthropoids are extremely closely related, and that their latest common ancestors must have been real primitive anthropoids, or as Dr. Morton has suggested this evening, perhaps a better name would be pro-anthropoids. This ancestral branch, destined to divide later into modern apes and men, certainly separated from the monkey stock long before it split into the modern anthropoid and human groups.

Professor Osborn, in his lantern slides of embryos and adult apes and men, called attention to the fact that man had not gone through any of those long-armed stages. None of us believes that man came from any of these modern anthropoids, certainly not from gorilla, chimpanzee, orang or gibbon, but in the opinion of most of us who have made a specialty of the subject, man arose from a common ancestor, probably in early

Miocene or Oligocene time, which was not so greatly specialized as the gibbon and orang for arboreal life. The enormously long arms and hands of these creatures represent a secondary adaptation to tree life just as in man the longer legs and shorter arms are adaptations to terrestrial habits. The common proanthropoid ancestor probably had the fore and hind limbs more evenly balanced.

One thing which ought to be clearly realized is that the great line of zoological cleavage is not the separation of apes from man, but the cleft between anthropoid apes and man as one single group and the tailed monkeys as another group. The difference between the chimpanzee and the tailed monkey is far greater in every point of zoological importance than the difference between chimpanzee and man. This is not a new idea. It was very clearly elucidated by Huxley, by Haeckel and especially in more recent years by Sir Arthur Keith, but it was first brought out 228 years ago, in 1699, by the English anatomist Edward Tyson, the first man who ever dissected an anthropoid ape. As the conclusion of that real classic in anatomy, Tyson gave a list of the features in which the chimpanzee resembles man more than monkeys and another list of the features in which it is more monkey-like. He listed 48 of the former and only 33 of the latter. However, mere figures here do not mean much for, as Chalmers Mitchell has said, "Characters have to be weighed as well as counted." But since Tyson's day an enormous mass of evidence has accumulated in support of his conclusion.

The recent studies of the mentality of the chimpanzee by Koehler and also by Yerkes indicate that these animals are essentially man-like in the mode or method of their mental operations, though in content or range their minds are more like those of monkeys or other higher mammals. As Koehler says, "Chimpanzees behave in a way which counts as specifically human." Perhaps we may say in brief that the chimpanzee's mentality is qualitatively human but quantitatively that of a brute.

There are many other points which I should like to discuss in connection with anthropoid-human relationships but in view of the lateness of the hour I will close.

January 20, 1928

THE LIFE AND WORK OF GEORGE S. HUNTINGTON *

(ABSTRACT)

C. F. W. McCLURE

Tonight there are gathered here the colleagues and friends of the late George Sumner Huntington, to do honor to him whom all of us admire and respect for his works, to whom many of us are held by the strongest and closest bonds. Posterity knows a man through his accomplishments; his personality lives only in the memory of those with whom during his life time he has intimately associated. It would seem proper that in this company I should dwell more on the man, on his great and compelling personality.

My acquaintance with Huntington dates back to 1890 when I was a student of his in the College of Physicians and Surgeons. It was not until the autumn of 1903, however, that I was brought into close working association with him. At this time both he and I were actively developing our respective collections in comparative anatomy; through our community of interest in these there grew the close friendship and professional relationship that existed between us to the end of his life. Very soon we were deeply engaged in joint investigations on two problems of the vascular system. It is because we worked so closely on these through a period of twenty odd years, collaborating in the publication of work carried on both together and independently, that I was so intimately acquainted with him professionally and personally, and so asked to address you this evening.

Huntington began life as a professional anatomist at the time when in this country anatomy was merely an adjunct to surgery; he died as one who had played a leading and dominant role in raising anatomy to the high status it now has in America —that of an independent science.

With the exception of six years spent in the German Gymnasium, Huntington obtained his education, both college and

*On account of the length of this paper, it is impracticable to publish it in full.

professional, in this country. The influence of the years in Germany is most evident throughout his life, *e.g.*, exactness and attention to detail, his love of the classics, his broad culture and the beginning of his collection of books on anatomy.

At Trinity College, Hartford, where he was a member of the class of 1881, his ever increasing number of electives in chemistry, botany and zoology indicates that he had determined to adopt a scientific career. There he received honors in mental, moral and political philosophy, in chemistry and in the natural sciences, ranking seventh in a class of nineteen. In 1884 he graduated from the College of Physicians and Surgeons, ranking second in the class of one hundred and twenty-five, and won first prize of $500 in competitive examination. At the same time he won the prize for the best clinical reports at the New York Hospital.

After graduation he entered Roosevelt Hospital, remaining until 1886, when he became assistant demonstrator of anatomy in the College, continuing until 1889, at the same time assisting Doctor H. B. Sands in his private practice. He was visiting surgeon to Bellevue, junior assisting surgeon to Roosevelt, and chief of the surgical clinic at Vanderbilt.

In May, 1889, he was appointed Professor of Anatomy and was the first man in a medical school in this country to give his full time to its teaching and to the investigation of anatomical problems; also to teaching by demonstration to small sections of the class.

Being a close student of evolution and deeply influenced by Darwin, Huxley, Owen and Gegenbaur, he now adopted morphology as a means of interpreting the structure of the human body, giving importance to comparative anatomy, and so vitalizing the whole subject. Thus he made clear the fact that the multitudinous detail which the treatment of man offers can be interpreted from the standpoint of the morphology of the different organ systems, and in relation to the application of structure to function. The significance and importance of the structural peculiarities of man he accentuated and illustrated by comparison with the morphology of corresponding structures in the lower vertebrates, and thus unrelated detail was replaced in 1889 by a lecture on a much higher plane. The

number of vertebrates that he personally examined, dissected and prepared, is almost unbelievable. As a comparative anatomist no one in America has ever equalled him either in practical experience or in the extent of information. He developed a definite plan leading to the establishment of what he hoped would be a permanent museum of comparative anatomy. Such a plan was formulated by him and published in Science in 1901 under the title "The Morphological Museum as an Educational Factor in the University System."

The Huntington collection of nearly six thousand mounted exhibits, practically prepared and mounted by himself, together with a large amount of material classified and catalogued, but still to be prepared, is the most extensive and complete in this country and unexcelled by any. Such a museum would rank with the Hunterian Museum of Comparative and Human Anatomy in the Royal College of Surgeons in London.

Dr. Huntington has left forty-five publications which were written between 1892 and 1920; several unfinished manuscripts; an unpublished history of anatomy and medicine. These publications cover a wide range in the field of vertebrate morphology and include investigations on the comparative anatomy and development of the digestive, genito-urinary, respiratory, nervous, muscular, lymphatic and cardio-vascular systems. Seven papers on the development of the vena cava and of the lymphatic system were published jointly with me between 1903 and 1920. His "Anatomy of the Human Peritoneum and Abdominal Cavity" appeared in 1903, and is profusely illustrated by five hundred and eighty-two figures, the greater number of which are drawn or photographed from his own dissections.

Variations in anatomical configuration as observed, especially in different mammals of the same species, were always of great interest to Huntington. He published five papers on the subject between 1895 and 1904 on variations of the muscular system in the lower primates and in man; in other papers he shows that variations in the genito-urinary tract can be interpreted by certain definite and recognized modifications possible in the embryonic ground plan of this tract in mammals. Other papers were on the comparative anatomy and development of the mammalian respiratory organs. For these he made nearly

five hundred wax corrosions of the lungs of mammals and of other vertebrates. A monograph, still unpublished, is the most extensive and complete exposition of the subject in existence. and must long remain a standard authority.

In 1906 Huntington and I read a paper before the American Association of Anatomists, in which we claimed that the main lymphatic vessels of the embryonic cat do not develop from the endothelium of the veins as maintained by Sabin, but develop *in loco* independently of venous-endothelium from embryonic mesenchyme. After an active controversy of about fifteen years the theory of the local origin of intraembryonic endothelium from mesanchyme is now generally accepted by anatomists, even by those who at one time most strenuously opposed our view.

Huntington's unusual and striking personality was a dominant factor in his power as a teacher and contributed greatly to his professional success. His sense of humor, gracious manner, ready sympathy, keen insight, and broad culture won him friends wherever he went. Everyone was impressed with his vitality, alertness and pugnacity. All his activities were characterized by an enormous vigor. When a young man, his daily exercise was taken with a professional wrestler. He was an incomparable woodsman and hunter. On camping trips in Canada he went without guides, preferring to do the hard work himself.

In the laboratory he showed the same indomitable qualities, working incessantly and loving his work, oblivious and insensitive to everything but the idea he was pursuing. In the height of our investigations he would often discuss with me in the evenings, over the long distance telephone, the results that the day's work had brought.

At home his hospitality had a charm. Discussions there took on a new angle. He would comment on the broad aspects of our work, he would laugh over humorous events of the day, he would sketch plans for the future.

I know of no teacher more solicitous for the success of his students or who did more to further their interests. He was surrounded by a brilliant group of young men, and between

the years 1895 and 1919, thirty-nine investigations were published from his laboratory, not including those he himself wrote. Some of the most prominent medical men in the country owe to George Huntington much of the impulse and ambition that has brought them their professional success. At the meetings of the Anatomical Association he invariably played a leading role, taking part in nearly every discussion. He was a valuable consulting surgeon, always alert to the practical significance of his anatomical work, and as an anatomist he never lost sight of the fact that the training of surgeons was one of his chief aims. The combination of a professional anatomist of highest standing with a surgeon of rare skill is unique; in these days of high specialization it is not likely to occur soon again.

Those of us who were Huntington's intimate friends will always regard him as highly for what he was, as for what he accomplished. His charm of manner, his humor, his deep loyalty to friendships, his masterful energy, his whole dominant personality we shall not forget. He was a rare man, a remarkable friend.

DISCUSSION

FREDERICK TILNEY: In many fitting tributes Dr. George Sumner Huntington has already been given his true proportions as a scientific figure, as a man of history, as a great American.

By contrast, what I have to say will seem meagre, for it is merely the recollections of one of his pupils, fragmentary recollections of many intimate and delightful relations growing out of associations with him in his laboratory—really impressions of him made by the contacts of his daily life upon those who served and honored and loved him.

If one could imagine the dingiest and most dusty loft-like room in New York, extending two stories up from 59th Street almost all the way through to 60th Street, filled with tables and shelves, cabinets and stands, all bearing a weird variety of unusual objects; if one could summon the visual powers sufficient to pierce a dense haze of tobacco smoke and a mist of steam rising from many bubbling kettles of mysterious injection material; if one could withstand the assault of an atmosphere

reeking with formalin and bearing the malodorous effluvia of some erstwhile denizen of the Zoological Gardens—perhaps a lion, or a bear, or an elephant (and most particularly an elephant) or a camel—come at length to be made immortal by the skillful hands and treatment of a great master anatomist; if one could sense all of this, then it might be possible to have some slight conception of the laboratory in which he lived and worked and wrought valiantly for science.

It was into this room that I first came, hat in hand and humble, one sultry October afternoon many years ago. I came earnestly seeking more knowledge from a source where I knew it was to be obtained. All of the things about this room which have just been mentioned struck me at once. Still more impressive, however, was the deep silence which pervaded the place. This silence was as strange as everything else in the room. It produced a most unusual effect. It seemed mysteriously dynamic and intensively concentrated. It was not the silence of dead and inanimate things, but an almost breathless interest, vivid and vital, seeking and finding revelation in the forms of organic matter. Off in one corner was Mr. Martin Peterson, the artist, silently making some of those famous drawings which have illustrated the Professor's researches. Across the room Mr. John Morris, the technician, toiled in silence in the preparation of that unparalleled embryonic collection which has offered the material for some important investigations. In a far corner a preparator worked upon the museum casings of models, while six or seven students at their various places were silently engaged in their several problems.

The fountain head of all this silence sat at his customary table in the dingy light of the old north window. I can well remember—for it seems but as yesterday—my first words with him. Instantly he made an indelible impression upon me, and I felt as if by some prescience that I had come under the spell of a compelling personality which would always hold me. As the years have passed, that spell has changed only to grow stronger and to create the enduring hope that its influence may never fail.

Somewhat hesitatingly, I expressed my purpose in coming to him, my earnest desire to study the brain. He did not warm immediately or much to this project, but asked me rather if I

might wish to pursue some cognate subject. My limited understanding of the subtleties in morphological expression left me wondering what a cognate subject might me. Up to this time I had never encountered this kind of a subject. Apparently my answer was not the correct one. I assured him I had no leaning whatever to cognate subjects and he, on his part, promptly directed me to another department of the school where, perhaps, they could give me something on the brain. I left him reluctantly with the result that I spent an entire year elsewhere which I might have had under his tutelage.

But I never ceased to think of him, and when the year was over I returned to the same laboratory to find it in its same dinginess and silence. This time I was more fortunate. A classmate of mine at New Haven, now the Dean of the Medical School, interceded for me with the Professor, especially when I had given the assurance that I was quite willing and eager to take up a cognate or any other kind of subject that might give me opportunity to work with him. And thus began a long apprenticeship extending over a number of years in which mere academic associations grew ultimately to devotion and friendship.

Favorable as this new start in the laboratory seemed to be, it was not without its harsh disappointments. He provided me with table, embryonic preparations, microscopes, camera elucida all in readiness, as I thought, for a wonderful new opportunity to study the brain. But what was my utmost amazement when he informed me that the task I had been assigned was to work out the development of the genito-urinary system in the domestic cat—a long, long way from the brain, and a long (I trust, uncomplaining) two years of effort.

Nothing impressed me more in this time than his peculiar method of teaching. This was as singular as it was individualistic, and quite as distinctive as the atmosphere of his laboratory. If there was one thing that distinguished the instruction which he gave me, it was its superb detachment, its masterly distance. Days went by, weeks passed, and further than the formal daily salutation, he never spoke to me or gave me the slightest attention. My problems grew and perplexed me. Yet, rather than disturb his intense preoccupation, I preferred to

slip into his library, to toil laboriously over questions which he might have answered in a moment. To my sensitive way of thinking, this seemed something like real neglect, but day by day, almost without my knowing it, he was teaching me in a language more eloquent than words. I had but to look over my shoulder to see him there at his table in the corner, working morning, noon and evening, weekdays and often Sundays and holidays, from one session to the next. It was by this irresistible and immortal example that he had stamped the greatest lessons of science and life upon several generations of physicians who came passing up the old stairway in the College of Physicians and Surgeons and saw him there at his task as I saw him intent upon his labors, oblivious to all else but the subject of his immediate study.

Then came a day, a rare day indeed, when he sat beside me for nearly a whole morning. After he had gone I felt inspired anew. I was conscious of a fresh zeal and determination, with something like a glow of enthusiasm even for the, to me, distantly related genito-urinary system of the domestic cat. Consciously or unconsciously, he had given me a new idea about teaching. He had clearly shown what is all too little understood by those who have the responsibility of medical instruction. Obviously, the chief purpose here is to inspire the student with the desire to learn, to provide every opportunity for such learning, and to eliminate in so far as possible all of the processes of formal indoctrination. For the real joy of learning comes of that sense of independent acquisition, that realization of possessing a self-gained knowledge. This most effective teaching was not by words but by work. That superb detachment already mentioned he carried into his formal instruction and lecturing as well. He spread before his students a feast fit for the gods and it was no fault of his when perchance the gods had gone ahunting in other fields than medicine, and none but minor deities came to his table. These considerations affected him not at all. Regardless of his auditors, he set forth in that splendid diction of which he was a master, the full content of his facts in all their details and relations. Each one of his lectures was prepared with meticulous care. The morning hours before them were spent in his library in concentrated

study of the subject he was to present and all of the drawings employed to illustrate his points, he practiced beforehand in fullest detail.

I have the blackboard reproductions in color of two of the drawings with which he illustrated his last lecture—treasured mementoes of his painstaking efforts.

This determination to present his subject, not down to the level of the student, but up to the full value of the problems in question, was a recognized feature in the high quality of his teaching.

If there is one criticism of American medical education to-day more valid than others, it is that our pedagogy has not risen much above the medical high school level. Dr. Huntington was one of the few medical teachers who entirely transcended this level. He may have recognized the necessity of practical, merchandizable learning, but he cherished and looked with greatest favor upon the highest ideals of true scholarship.

In addition to his enormous capacity for work, he was versatile both as a classical scholar and linguist. As collector of rare and old books, particularly anatomical works, he manifested a zeal in keeping with his many-sided versatility. He was also a student of invertebrate zoology and botany, and his collections in these branches of science may well enough have brought him sufficient distinction were they not surpassed by his morphological collection. This latter, the personal work of his own hands, equals, if it does not overshadow, any similar collection in existence today. Added to these capacities was a prodigious memory made invaluable by a most voluminous scientific reading. This was of inestimable service to himself as well as to the members of his staff, for he could with the greatest of ease give references to former work along a great number of research lines.

His laboratory was an American Mecca of anatomy. It would be impossible to give the entire list of his distinguished visitors from all over the world. Few scientists interested in this field of inquiry left New York without coming to see him. Whenever we heard the old elevator door slam with unusual abandon, we knew that the beloved Spot McClure had arrived from

Princeton. Those were gala days. Professor McClure and Professor Huntington had formed a scientific alliance by means of which they gained many notable victories in revealing the true nature of the lymphatic system. The days of Dr. McClure's visits with us were always feverish ones. The entire research work of the previous month or so was carefully reviewed and enthusiastically discussed by the two leaders. Then the desk of each worker was visited and the progress carefully criticised. We learned all the news from the battlefront of the great lymphatic war. We heard how the enemy at Johns Hopkins had outflanked us by injecting India ink into the jugular lymph sac. This ominous information left us almost in panic, but it was nothing compared with the bulletin that our adversaries at Cambridge had stolen a march on us by ligating the omphalomesenteric vessels. In consequence of this we felt ourselves thoroughly routed and almost in despair. But before leaving us Professor McClure would develop some degree of optimism about our efforts, and our own Professor calmed our troubled spirits with the assurance that this was only Spot's way of making us all work a little harder and thus assure our ultimate victory.

Once Sir Arthur Keith spent two days in the laboratory which gave us an opportunity of hearing these two world-famous authorities discuss their studies in human evolution and filled us again with new appreciation for the morphological masterpieces which Dr. Huntington had created.

The great Waldeyer also visited the laboratory, and was lost in admiration at the marvels of that anatomical collection which must at length take its place among the real treasures of human achievement. The old German scholar took pains to let us know how fortunate we young men were to be working under the direction of the greatest morphologist then living in the world. We were gratified to know that Waldeyer had recognized this fact; as for us, we had been very sure of it this long time.

There was another distinguished visitor who came to see us more often. We could always tell when he was there because

he made the rafters—or whatever held up the ceiling—reverberate with loud and prolonged laughter. In fact, he was the only one who ever effectually shattered the dignified silence of our laboratory. More than this, he infected our Chief with his boisterous merriment and the two laughed loudly together. This other honored visitor, then the Dean of those happy days, is none other than the present distinguished President of this Academy of Medicine, Dr. Samuel Lambert. For us it was a revelation to see these two great men descend from their high places and before our eyes become Damon and Pythias again as they had been in their earlier medical days, to reveal that strong and binding friendship which had carried them through many years of arduous labor together; which had kept them shoulder to shoulder through all the activities of a strenuous faculty life, which persisted deep and unchanged to the end. It was that quality and capacity for friendship which drew to Dr. Huntington the large group of physicians and surgeons who made New York medical history in the past quarter of a century. It was this friendship also which held the anatomical department together, and he, as its guiding spirit, was the most unfailing of friends.

Presently, probably within the next few weeks, the Department of Anatomy will move up-town to its magnificent new quarters in the Medical Center. Perhaps it is even well that he is not here to go with it. This new mantle of splendor might have palled upon his true simplicity.

They tell me that the old laboratory is now vastly changed. I cannot bear to set my foot in it ever again. For me a new silence is there now, the real silence of departure and of death. And yet that old room with its dusty equipments, those old times and those old affections, are stamped upon the memories of many of us as the golden days of life. Surely *amor vincit omnia*, and his presence has not passed while we yet live. We shall always see him sitting at his table in the dingy light of the old north window, working as in a glory, still inspiring all our efforts to be worthy of him, our great master, our beloved benefactor.

SAMUEL W. LAMBERT: I first met George S. Huntington in the fall of 1882 when as medical students we were in the College of Physicians and Surgeons. He was one year ahead of me but we went along similar lines and saw much of each other, both in the office of our preceptor, Dr. Henry B. Sands, and in the dissecting room. We both believed we were started on a surgical career. In 1882, medical instruction at the College was given entirely by lectures, either theoretical or clinical. Evidence of attendance was given only by the purchase of cards for the theoretical lectures and for anatomical material. George Huntington bought his real education, like the rest of us, outside or inside the College walls, by paying the younger hospital, dispensary and laboratory physicians for private courses.

Dr. Huntington had been educated in part in Europe and had a fluent command of French and German and a greater facility with Latin and Greek than most College graduates of his day. He had a body that knew no fatigue and a mind that took in every branch of medicine. During his second year he was the personal assistant of Dr. Sands, did the microscopic work of private patients, assisted at operations or gave ether for that leading surgeon of New York. He was prosector for Dr. Sabine, the professor of Anatomy, and was taking private courses in pathology, in physical diagnosis, in the quiz class of Dr. Richard J. Hall and read medical science enough hours to occupy him from sixteen to eighteen hours a day.

Dr. Huntington was an interne on the surgical staff of Roosevelt Hospital. On leaving the hospital he was made a demonstrator of anatomy at the College, conducted a quiz class for Dr. Sands, for whom he became an assistant, both in private work and as assistant attending surgeon to Roosevelt Hospital. In 1889, at the age of twenty-eight, he was made lecturer and one year later, Professor of Anatomy. His surgical career, which had promised much, was cut short before it really began, and he found his life work in the fundamental medical science of Anatomy.

During thirty-five years he worked in embryology, in comparative anatomy, and in human anatomy and built up a collection of specimens which is so varied, so complete, so full of unusual examples that no other institution possesses anything like it. As an investigator he left the beaten track of his predecessors and his contemporaries and added to comparative anatomy an exact knowledge of the internal organs of the vertebrates, a subject which had previously been neglected by every anatomist. He was always a fulltime man in that he worked in term time and in vacation, in his college laboratory and in a hut in the Canadian woods, he labored seven days a week and was at his dissecting table from eight in the morning until seven in the evening, and his evenings were given to reading. He was a full time professor, not because he devoted himself only to his professional work, but because his work in lecture room, in seminar, in the dissecting room with undergraduate students and with his museum, laboratory and his books, filled every hour of his waking time. He wrote scientific monographs on his special pieces of investigation, which left nothing further to be added by others. He left unfinished a study of the comparative anatomy of the lungs which is as thorough as his best previous work and which was still growing when his final premature breakdown came at the age of sixty-two. At the same time he had begun a study into historical medicine in which he emphasized the content and human interest of the text of some of the books of the 16th century, which are usually regarded purely as collections of anatomical drawings of academic interest alone.

George Huntington was a born collector who studied his collections for their own value; he was not a mere acquisitor. Early in life he collected beetles and butterflies, and was no mean authority on the coleoptera. When a student in Germany and while at Trinity in Hartford, he collected early editions of the classical authors, especially the smaller editions in Greek and Latin of Elzevir and Aldus. As a young surgeon he collected the files of the journals containing the record of the development of the science of surgery which followed the epoch-making work of Lister. When he gave up surgery he presented his surgical collection to the library of the Lying-in Hospital, in

which I was then most interested. His collection of books on anatomy is grouped about Vesalius as the central figure and is particularly strong in the publications of the 16th and 17th centuries. It forms almost a complete history of the renaissance of anatomy following the revolt from the Galenical traditions of fourteen centuries.

His most active work as a collector was put forth in gathering together the dead bodies of the lower animals both of rare and ordinary species, from which he built his museum. These dead bodies came from the zoological parks, from the ships in the harbor which were importing animals for the menageries of the Hagenbecks and Barnums, also in special preservative cases from the most distant places of the earth. They arrived in greater numbers than could be handled quickly, and the refrigerators at the College were full to overflowing with vertebrates on cold storage.

No one who was working at the Sloane or Vanderbilt Clinic in 1894 can ever forget the arrival at the College of the camel. This dead beast was delivered at the College Yard at 3 p.m. on Friday, July 2nd. New York was enjoying one of its hot spells. The Hicks family, both Gilbert and Eddie, were gone for the week-end. Not even the Professor was on hand, and the unwelcome camel lay in the sun by day and the heat by night, with the temperature ranging from 80 odd to 96 in the shade, during the holidays of July 3rd, 4th and 5th, Saturday to Monday. The travelers on the elevated road a block away, thought that a terrible epidemic had befallen Roosevelt Hospital, and the whole neighborhood mourned over the death of that particular camel. On Tuesday, the Board of Health came to the rescue and the deceased was promptly buried at sea. On one winter's day, Eddie Hicks, who was not a muscular man, received in a gunny sack a dead South American python, from a ship near the Battery. On the way up town the bag, which was big with a 16 foot snake, was laid next to the steam pipes on the elevated. As Eddie went down 59th Street to the College, the rotten sack gave evidence of active peristalsis, but fortunately, did not burst open until the laboratory was reached, when the boa constrictor was overcome, but not without a long

struggle. He died shortly, a violent death, and his insides adorn the museum. When Jumbo, the pride of London and the triumph of Barnum, died, his skeleton and his hide went to the Museum of Natural History, but his entrails went to the College and his ileo-cæcal junction forms a prominent dried specimen in the Huntington collection. Many other vicissitudes of fortune befell during the collecting of Dr. Huntington's specimens. Professor Huntington's dissections are models of neatness and dexterity and show minute details. His laboratory was a dusty, uncared-for chaos in which the individual specimens formed oases illustrating the scientific accuracy of a genius. His catalogue was in his own head, and he knew what he had and where he had left it, and woe to him who had moved its position.

George Huntington carried the tradition of the College of Physicians and Surgeons as an anatomical school of medicine to the highest point of its development on those lines. He was always a champion for his department and for many years he made it the central feature of every change in the curriculum. When he first began his work, the department of anatomy was the only spot in the College of Physicians and Surgeons where the undergraduate of medicine could get personal experience of the practical art and the science of a medical specialty. As time passed Professor Huntington saw other departments develop along similar lines and take on new life and vigor, but none of them diminished the educational tender of his department. Most of the graduates from the College, who have become prominent surgeons in this and other cities, have served their apprenticeship as undergraduate prosectors and as postgraduate demonstrators under George S., and the surgical work of Bellevue, New York, St. Luke's, Presbyterian, Roosevelt and many other hospitals now feel his influence to their great and lasting benefit. George Huntington left open for all students the gate to success in anatomical study, but he took no interest in the laggard or the dull-witted, and he chose his favorites on his own estimate of each man's ability alone. His professional life was that of an intellectual enthusiast, devoted to an ideal to make of it all that he could in the pursuit of his controlling goddess, the science of anatomy, and with him life was always

short and art long. He exemplifies in his scientific career the philosophy of Francis Quarles:

"What has thou then, proud flesh and blood, to boast?
"Thy days are evil, at best; but few, at most;
"But sad at merriest; and but weak, at strongest;
"Unsure, at surest; and but short, at longest."

THE DOCTOR LOOKS AT CULTURE

(Abstract)

Joseph Collins

There are many reasons why a youth studies medicine and chooses it in preference to any other profession, but whatever incentive he has, success is his goal, not only success measured by professional reputation and material prosperity, but by self-realization.

Two elements facilitate self-realization—taking thought and gaining culture. Familiarity with the intellectual activity of the past and present and reflection upon its bearing on our welfare, conduct and lives constitute culture.

It should be part of education, but in reality the relationship between them is distant. A man may be cultured and have small education, Walt Whitman for instance, or may be greatly educated but not necessarily cultured, Robert Burton for example.

Education is to the building of a house what culture is to its decoration. Vocational education equips the mind with the essentials of the trade or profession; culture adorns it with the humanities. Physicians should study living languages and the sciences for many reasons and steep themselves in the humanities for two—to fill their own reservoir of pleasure and to generate energy in their work. By studying physiology and pathology they will gain self-approval; by studying human nature they will gain the approval of others. The sort of culture they need is best obtained by familiarity with poets, philosophers, biographers, thinkers, musicians and art.

It is agreed that the welfare of the soul is enhanced by culture, but that it enhances professional efficiency is not so well recognized.

Culture is obtainable everywhere, in galleries, museums and libraries by preference. Neither Benjamin Franklin nor Thomas Jefferson had been to college; William Osler and William James had not either; yet they were men of great culture. If colleges should teach students to think, college might be the best place to attain culture.

I am convinced that the medical student who knows the great classics of the past is better equipped to practice medicine than he who has Quain, Osler and Howell at his finger tips. Anyone who knows anything thoroughly, be it history or literature, music or sculpture, may achieve a reputation for culture. Arpad Gerster, Walter James, Pearce Bailey and Frank Meres were ideal men of culture.

Culture has a reputation for creating an elite by giving to some advantages that others have not; anyone can attain it so there is no favoritism. It is said to engender idleness by unfitting man for ordinary labor; John Cotton Dana is an example that it does not. It has been objected that by its dealing with the past, it hampers progress; thrilling prowess and civic virtues are never out of date and ancient literature is filled with such examples. And the creation of an elite should be desired and striven for.

Were there any unanimity of opinion about what the duties and even the meaning of medicine are, culture might be given a larger place in the profession. Without basic scientific knowledge it is of little use, but all science is just as ineffectual. Man is the problem to understand when the doctor is confronted with illness and science does not consider man but facts. To draw logical inferences is one of the physician's duties and he cannot do so if he bases himself only on scientific knowledge. A physician may be successful though uncultured, but the majority of immortal physicians were students of matters beyond professional science. If children could develop the habit of reading, and be taught to like it, they would become men of culture as naturally as they become anything they choose to be.

Some physicians of the past have left literary remains that are not to be disdained. Cadwallader Colden, Benjamin Rush, Samuel Bard, Elihu Smith, David Hosack, John W. Francis, William Gibson, James Jackson, Daniel Drake, Elisha Bartlett, Samuel Gross, Oliver Wendell Holmes, Henry Bigelow achieved self-realization and culture.

William Osler and Weir Mitchell are shining examples of the beauty of great culture in the physician's mental luggage. Anyone who is disposed to doubt that the physicians who wrote their names indelibly on the scroll of life were men devoted to the humanities has only to read Benjamin Ward Richardson's "Disciples of Esculapius" to have his doubts removed. And Charles Richet's little book "Le Savant" shows how delightful it must be to be both a great physician and a man of culture.

The student in medicine is not getting a square deal. Most of the work he has to do is dull and dreary and wholly concerned with technical acquisition. His medical education should be made attractive.

My suggestion to remedy the failure of colleges to provide students with general culture is this:

No professor shall be a member of any Medical Faculty who has not stood, or cannot stand, a verbal examination in Medical History conducted by a Committee made up of learned professional men, that is, by men of learning beyond their profession. Candidates for professorship of histology, for instance, should be familiar with the life of Anthony Leewenhock. For physiology should talk entertainingly and instructively of Cesalpinus, Harvey, Joseph Priestly and Stephen Hale. For anatomy should know Mondinus, Vesalius, Fallopius, Eustachius and Sylvius thoroughly. The candidate for bacteriology should spread good knowledge of Spallanzanzi, Pasteur, Koch, Roux, Behring, Reed and Ross. How an examiner with sadistic streaks would exult should the opportunity come to him to examine some professors of what was once called the Theory and Practice of Medicine as to what they knew of Brown, of Cullen, of Meade, of Radcliffe, Black, Heberden, Haller, Werlhof, Broussais, Louis and so many others! Quacks should be known also: Paracelsus and Mesmer, Perkins and Greatrakes.

A Faculty made up of men who had passed such examination could make their teachings engaging and inspiring and whet the appetites of their pupils for further historical and cultural pabulum.

When I began to devote my energies largely to Neurology, I still kept a general medical service in the hospital and several times served as examiner of candidates for the House Staff. The reputation which I shared with all neurologists, of being "more or less crazy" was enhanced, I fancy, by confining my questions in the oral examination to general education rather than technical education, questions that tested the candidate's emotional reactions. If a man told me correctly who invented the steam engine, and how he came to do it, and then in reply to further interrogation of some of the benefits that had flowed from it told me that by means of it fat men were able to get to Coney Island in a quarter of the time it took a hundred years ago, I gave him a perfect mark, because it suggested to me that he had a sense of playfulness and a sense of humor. If he knew about the Dutchman who discovered in Java the skull of pitecantropos that was thought to be the link missing between man and monkey, but expressed some doubt of the validity of the claims that were made for it, I felt that association with him for eighteen months would be beneficial, skepticism being such a desirable possession for any physician to have.

If he intimated that one of his reasons for being satisfied with our alleged Simian ancestry was that further investigation might reveal a far less desirable one—the snake, or the shrimp for instance, I implored him to join us.

The difficulty is to get at the student. He is sometimes ignorant himself of the essentials of his vocation. They are character, culture, commiseration and courage; for the physician must eventually treat the ills of the world and to do so successfully he needs all of these qualities. Not only must he develop his personality but he must help create a body of public opinion whose momentum will wipe out our self-consciousness, crush our prejudices, destroy our self-righteousness and purge us of a besetting sin: subordinating the universal to the individual.

Combined Meeting of the Section of Medicine, and the American Dietetic Association, January 17, 1928

THE CONTROL OF PROTEIN IN THE DIET*

(ABSTRACT)

EUGENE F. DU BOIS

There has been a tendency for clinicians and dietetians to use low protein diets indiscriminately but in the last few years there are evidences of a trend towards an increase in the protein ration. In all work on dietetics we must remember the fact that the profession has changed its attitude many times in regard to the standard dietary in different diseases. Diabetes is the best example of this.

It is possible to construct a metabolism map in the form of a triangle with fat at one corner, carbohydrate at another and protein at the third. On such a map we can place the standard dietaries used by different races and also observe the possible positions of the experimental subjects following the ingestion of test meals. One of the most interesting portions of such a diagram is that which represents nitrogen minimum, "the wear and tear" quota. In normal subjects the nitrogen excretion can be reduced to 2-3 grams a day and one man has reached the low level of 1.58 grams. We must give larger amounts than this, 6-7 grams of nitrogen a day in order to maintain nitrogen equilibrium. This represents 40-45 grams of protein a day, a figure which is about one-third the ordinary dietary standards.

Much experimental work has been done on animals with very high protein diets. Some of the earlier studies indicated that a high protein diet causes kidney damage. It does cause hypertrophy of the kidney but many investigators have found no evidence of nephritis. Osborne and Mendel obtained normal growth of white rats on a diet containing a very high proportion of protein, some fat and no carbohydrate.

The Eskimos for thousands of years have been living on an almost exclusive meat diet with very high protein content. They seem to enjoy excellent health and a recent survey by Thomas

*From the Russell Sage Institute of Pathology in affiliation with The Second Medical (Cornell) Division of Bellevue Hospital.

shows very little nephritis or hypertension. At one time the Indians of the western plains lived on buffalo and the inhabitants of the South American Pampas also subsisted almost entirely upon meat. Their general condition seems to have been much better than that of the Bengalis on their low protein ration.

The nitrogen metabolism is high in fevers and other toxemias. Some patients with severe diabetes show increased nitrogen metabolism. There is evidence that diabetics get along better on a low protein diet than on a high ration. On the other hand there may be danger in keeping the protein too close to the minimum. Some patients with nephritis show a marked negative nitrogen balance and suffer from protein wastage. Some of these patients can take a relatively high protein ration and retain large quantities of protein to replenish their body tissues.

Combined Meeting of the Sections of Neurology and Psychiatry, and Obstetrics and Gynecology, January 24, 1928

MERALGIA PARESTHETICA

(Abstract)

James H. Huddleson

Meralgia paresthetica, generally considered a syndrome of a certain peripheral nerve alone, may also arise on the basis of a lesion at the level of the cell bodies of the sensory neurone of the second order, as well as more commonly at any level (cell-body or process) of the neurone of the first order. Characteristics of the central pain that may arise from destructive plus irritative lesions of cell-bodies at and about the level of the second lumbar segment, are similar to those of the pain of herpes zoster of the second lumbar root ganglion, sufficiently to warrant considering them both as possible causes of meralgia. Cases of both zoster and of tabes have been reported, showing the syndrome of meralgia paresthetica. Cases of pain with paresthesias, essentially of the same type as those seen in meralgia, and referred peripherally from lesions of syringomyelic type, suggest that the syndrome under consideration may

occasionally arise from a localized syringomyelia or hematomyelia.

The extent of the skin area affected in meralgia is markedly variable. Sometimes it is only that of the gluteal branch of the lateral cutaneous; sometimes that of the anterior crural, genitocrural, or adjacent nerves is involved in addition to or replacing the lateral cutaneous. The latter may be derived from the first or third as well as from the second lumbar root, and there may also be anastomoses distally. A central disease-process could affect a small or large part of the peripheral nerve's distribution.

Peripheral lesions resulting in meralgia paresthetica are widely various—zoster of the ganglion, tumor, pregnancy, obesity, different types of trauma to the nerve trunk at vulnerable points, abdominal or pelvic inflammatory disease, general infections and intoxications.

As symptomatic treatment, if a cause is not found, the following physiotherapy has met with some success: Radiant light and heat to the thigh and leg, followed by massage of the outer side of the thigh; static brush discharge along the course of the lateral cutaneous. More radical measures suggested are X-ray, alcohol-injection, or excision of the nerve.

MERALGIA PARAESTHETICA—A NEW CONCEPTION OF ITS ETIOLOGY AND TREATMENT

Byron Stookey

The etiological factors in the production of meralgia paraesthetica Dr. Stookey believes are an abnormal position and angulation of the external cutaneous nerve as it leaves the pelvis. Angulation and traction upon the nerve at this point is increased by standing and walking as are the symptoms of meralgia paraesthetica. Abnormal angulation with repeated traumatism due to movements are well known as etiological factors in the production of late ulnar neuritis secondary to fracture of the humeral condyles and of brachial neuritis due to cervical ribs or fascial prolongation from rudimentary cervical ribs. The mechanism in the production of meralgia paraesthetica Dr.

Stookey believes is comparable to these two well known conditions.

The surgical treatment suggested is section of the external cutaneous nerve without resection allowing the nerve ends to lie in alignment in order to facilitate regeneration. Defects of 1-2 cm. may be bridged spontaneously when the nerve ends lie in smooth fascia planes. Were spontaneous regeneration to take place the external cutaneous nerve would thus be lengthened and recovery of sensation would follow. In any case, permanent anaesthesia in the area of the external cutaneous nerve is to be preferred to the paraesthesia and pain found in meralgia paraesthetica.

THE CONVULSIVE STATE

SAMUEL BROCK

I. Introduction: Definition.
II. Pathophysiology: Types of Convulsions.
III. Analysis of factors involved in the production of convulsions:—(a) humoral, (b) cerebral.
IV. The Cerebral Vascular Apparatus (Vasomotor theory).
V. Psychological Theories.
VI. Heredity: "Reflex Epilepsy."
VII. Pathological Considerations.
VIII. Conclusions.

I

For a number of years it has been evident that epilepsy is not a disease *sui generis* but a symptom complex of a many-sided nature. As a consequence, one began to speak of "The epilepsies." Of late, however, the term "convulsive state" has been introduced to replace the time-worn word "epilepsy" with its traditionally restricted connotations.

By the convulsive state is meant a paroxysmal disorder of clonic or tonic muscle spasm involving larger or smaller segments of, or even the entire body. The resultant movement is an involuntary disordered, utterly purposeless one, throwing the part, or the entire body out of normal into an abnormal posture. Whether consciousness is or is not disturbed will depend upon considerations to be discussed later.

In the idiopathic type of convulsive state (grand mal) three phases may be recognized in the order of their appearance, one —a fleeting *flaccid stage* during which the individual falls; two—*the tonic phase;* three—the *clonic phase.* Quite rarely the attack may be limited to the flaccid stage in which the acute general loss of tone produces sudden "deposturing" or collapse. The tonic stage with unconsciousness is due to suspension of cortical function, and the uninhibited activity of brain stem centers. The succeeding clonic phase indicates return of cortical activity, even irritation. The tonic and clonic stages may appear separately in man, and for the sake of clarity will be so considered in the following.

II

The types of such seizures are:—(1) Tonic, and (2) Clonic.

The tonic type is often seen as stated. It succeeds the very transient flaccid stage of the so-called grand mal seizure, and is usually generalized. Brain stem centers are functionally disconnected from the dominant cerebral cortex, and their uninhibited activity or their isolation results in a decerebrate rigid state. Normally the inhibiting impulses are believed to be mediated by the fronto-ponto-cerebellar pathways (Weed, Warner and Olmstead). The stimuli are transmitted from the brain stem centers to the final common pathway probably along so-called extra-pyramidal pathways. This tonic state consists of a widespread spasm of the extensor muscles. The head is retracted, the back arched, the extremities extended and adducted, the hands are pronated, the fingers are flexed, the feet are in equinus, the jaw is tightly closed (Sherrington, S. A. K. Wilson).

In man the upper extremities are usually flexed, and the head and eyes turned to one side. Consciousness is lost. Time will not permit me to go into the well-known accompanying vasomotor, respiratory, pupillary changes, nor into the question of aurae, etc.

The clonic or Jacksonian fit is due to irritation of the motor cortex of the brain; the abnormal stimuli are carried by the intact pyramidal tract to the lower motor neurone, thence by way of its final common pathway to the musculature. If the focus of irritation spreads, then adjacent centers in the Rolandic

area are affected in a very regular manner which is conditioned by their well-known anatomical juxtaposition. The movements are interrupted, and frequently segmental. When this type of convulsion occurs alone, consciousness is not disturbed, until the movement spreads from one half to the other half of the body.

A spinal and bulbar form of convulsion is best seen in cases of strychnine poisoning. Here there is anarchy in the realm of the lower motor neurones, and a tonic extensor spasm is noted, comparable in many respects to the above-described. Consciousness is fully retained.

III

If one analyses the many factors involved in the production of the convulsive state, it becomes evident that they may be grouped under one of two headings:—A. Cerebral; B. Humoral. The experimental work of W. E. Dandy and R. Elman illustrates this duality best. Let us give a normal cat absinth by mouth. In large enough amounts, convulsions will result. Here we have the operation of a pure humoral exogenous factor. Nextly, produce a lesion in the cerebrum of the animal either by simple extirpation of the cortex and sub-cortex or by simply placing a foreign body beneath the cortex. One to five months later it is found that one-third to one-seventh the initial dose of absinth will be convulsogenic. By injuring cerebral tissue a cerebral factor is introduced.

In Table I we have the humoral factors.

TABLE I

Humoral Factors

I. *Exogenous*
1. Alcohol, lead (absinth, camphor—monobromate, santonin, picrotoxin, apomorphin, etc.).
2. Insulin (anoxemia ?).
3. Alkalosis (due to hyperventilation).
4. Foreign Proteins.

II. *Endogenous.*
1. Uremia.
2. Eclampsia.
3. Endocrine dyscrasias.
   a. Parathyriod
   b. Thyroid
   c. Pituitary.
4. Toxins of the infectious diseases in infants.
5. Spasmophilia.

Among them, certain items deserve especial comment. In rare instances, the individual may suffer from the convulsive state only when sufficient alcohol is imbibed. Rosett in this country and O. Foerster in Germany have drawn attention to the effects of forced over-ventilation of the lungs. In normal persons, tetanic features appear. In 55% of epileptics, the convulsive state is precipitated. The alkalosis produced by the deep breathing is, in some way responsible for the attacks, possibly through disturbance of the calcium ion balance in the blood (F. Georgi). The tetany induced in normal individuals points to the parathyroid gland, and disturbed calcium metabolism. In this connection, Geyelin, of New York, deserves credit for emphasizing the beneficial effects of starvation on those afflicted with convulsions. Workers in Cobb's Laboratory in Boston, have proven that the *acidosis* accompanying starvation is the decisive factor in this prevention of convulsions.

Strangely at variance with this work is that of the Italian investigator Cuneo, who believes that there is a disturbance in the starch metabolism resulting in the formation of certain acids (acetic, lactic, butyric, tartaric). Normally the liver and small intestine break these up into urea and sodium carbonate. In epilepsy they are found unoxidized in the urine* An acidosis results, in the presence of which the cellular nucleo-histon bodies split into nucleinic acid, and a convulsogenic proteose (The salts of the afore-named acids are also convulsogenic). Donath (quoted by Muskens) believes that in the convulsive state, alkaloid-ammonium compounds, fragments of normal metabolism, react on a nervous system, the threshold of which has been lowered by either hereditary, or congenital, or toxic, or infectious, or traumatic affections. These compounds are trimethylamin, cholin, kreatinin, guanidine, and ammonium carbonate. Except for the first (trimethylamin) Donath produced convulsions with these agents.

A number of observers have studied the question of the split products of protein metabolism. L. M. Wallace and W. D. Nicol (England) found that about 20% of epileptics gave positive skin reactions. They removed the offending proteins

*Osnato, Killian and their co-workers have found increased lactic acid in the blood and cerebrospinal fluid of epileptics in the interparoxysmal period.

from the diet in some of these cases, gave others peptone by mouth, and reported good results. Others, including J. S. Collier, were disappointed in the use of protein therapy. In connection with anaphylaxis, V. M. Buscaino's work deserves mention. Examining 396 thyroid glands he isolated an abnormal protein from the thyroid of 71% of epileptics. Abderhalden tests with the serum of epileptics reacted positively with the thyroid of epileptics much oftener, and more intensely than with non-epileptic thyroids. In certain cases he regards the convulsion as an anaphylactic crisis.

In the group of endogenous humoral factors, the endocrine dyscrasias are of especial interest. The role of the parathyroids in the convulsive state of tetany is well known. In three cases of severe epilepsy, O. Foerster implanted human parathyroid glands. He reports unmistakably beneficial effects on the number and intensity of the convulsive seizures. In regard to the thyroid gland, Buscaino's observations, above-mentioned, are of interest.

Elsberg and Stookey showed that thyroidectomized animals are more susceptible to absinth in the production of convulsions. The parathyroid glands may also have been injured in their experiments. The foregoing observations lend weight to the belief that the parthyroid and thyroid glands cooperate in removing toxic convulsogenic elements (foreign protein split products?) from the blood stream (Timme, Zabriskie).

As regards the pituitary gland, two points deserve mention. One is the frequency of signs of dyspituitarism (acromegalic features, or Fröhlich's syndrome) and sella turcica changes demonstrable by X-ray, in the epileptic. The other is the hypothesis in which the pituitary gland is believed to enlarge periodically in a sella too small for it. This results in a suspension of function of the posterior lobe which is said to produce an increase of general cortical irritability. The nearby uncinate gyrus is pressed upon and is apt to be the initial explosive focus.

The gonads have been omitted from the table because the precise role they play is very difficult to define.

Let us pass to a consideration of the cerebral factors.

The following table is an enumeration of the Cerebral Factors.

TABLE II

Cerebral Factors

A. Diseases

1. Neoplasms (including bony growths).
2. Congenital and heredo-degenerative disease.
3. Degenerations and scleroses (*viz.* multiple sclerosis, tuberous sclerosis, encephalitis periaxialis diffusa, senile cortical atrophy, presenile gliosis, etc.).
4. Traumatic processes.
5. Infections and parasitic disease, (*viz.* lues, tuberculosis, encephalitis, abscess).
6. Vascular disease (vascular spasm, arteriosclerosis, hemorrhage, emboli).

B. Irritants

1. Mechanical (*viz.* air).
2. Electrical.
3. Thermal.
4. Chemical (*viz.* strychnine painted on the cortex).

C. Psychogenic Processes

1. Theory of Regression (L. Pierce Clark).
2. Theory of Rosett: The normal epileptoid reaction.
3. Hysteria.

From the above table it becomes evident (A) that almost all organic cerebral diseases can induce the convulsive state. Is it possible to find a single pathological determinant common to all these states which is the true cerebral factor?

MacRobert in this country and Muskens abroad both suggest dysmyelinization as a possible factor. The former stresses "an anatomic defectiveness in which the vital feature is a paucity of functionally active fibre tracts. . . . This specific defect may be but a part of a wide spread neural agenesis or may exist alone, the result of a failure in the final stages of development, namely myelinization of the nerve fibres." A kind of defective insulation of the nervous stimulus results. In this connection paroxysmal spasms are rarely encountered in amaurotic familial idiocy, although Hassin stresses the frequent occurrence of decerebrate extensor hypertonus. Doctor B. Sachs does not regard convulsions as an essential part of this disease in which

almost all the ganglion cells of the nervous system degenerate. Whereas in encephalitis periaxialis diffusa of Schilder, a disease in which the fiber tracts suffer most in a dysmyelinization process, convulsions are frequent. Yet the dysmyelinization theory hardly seems tenable when one considers the important humoral factors. It has not been proven by any of the finer anatomical studies, and throws no light on the convulsive state produced by certain vascular conditions to be described.

The observations of O. Foerster seem to show that in the vascular mechanism of the brain we will find the basic cerebral factor. On the operating table he has observed at least one hundred times a *preparoxysmal* vasoconstriction and anemia of the exposed brain with a diminished volume. The tonic convulsion then occurs with a rapid fall of cerebrospinal fluid pressure. The removal of cortical function due to the vasoconstriction permits the unbridled or isolated brain stem centers to manifest this tonic decerebrate phase, and serves to explain the unconsciousness. Then venous stasis comes on rapidly accompanied by a great increase in brain volume and cerebrospinal fluid pressure. The stasis now produces cortical irritation and the clonic (Jacksonion) phase appears as a consequence. This vasomotor theory (Nothnagel) explains the attacks, sudden onset, and cessation, and the radiation of a Jacksonian cortical attack. The sensory aura and the post-paroxysmal weakness may be ascribed to transient loss of function from local anemia. Further weight is lent this vascular basis when we consider the various vascular conditions which are able to provoke the convulsive state.

TABLE III

Vascular States

A. Disease of Cerebral Blood Vessels

1. Arteriosclerosis.
2. Endarteritis obliterans.
3. Angiospastic migraine.
4. Raynaud's Disease.
5. Aneurysms.
6. Embolism.
7. Congenital smallness of carotids or vessels of the Circle of Willis.

B. Changes in Cerebral Circulation

1. Heart block.
2. Restoration of previously impaired cerebral circulation.
   A. After drowning.
   B. After strangulation.
   C. After suffocation.
3. Pressure upon, or ligation of carotids and vertebral arteries.

Recently more evidence favoring the vasomotor theory was given by the work of O. B. Meyer. Pieces of cortical arteries show rhythmic spontaneous contractions when placed in normal serum. These can be kymographically reproduced. If the serum of an epileptic be used the contractions are absent or diminished; this occurred in 15 out of 17 cases irrespective of the time (with regard to the paroxysm) of the withdrawal of the serum. In six cases of hyperthyroidism the contractions were increased.

Some years ago MacRobert and Feinier explained the frequency of the convulsive state in temporal lobe neoplasms by assuming that the pressure of the tumor interfered with the circulation in the overlying Sylvian artery.

Increased cerebrospinal fluid pressure of itself does not cause convulsions (W. M. Kraus), but if other factors are present then such increase will help precipitate the convulsive state (Elsberg and Pike).

V

The convulsive state has also been regarded as essentially of psychogenic origin, especially by L. Pierce Clark. Following the psychoanalytic approach, he regards the fit as a regression, a withdrawal from reality into the blessed Nirvana of the infrauterine foetal state. Objections to this point of view are many. It does not account for the occurrence of convulsions in deep sleep (which, in itself, is an adequate escape from reality), the incidence of convulsions in animals of the mammalian phylum, nor does it explain the status type of convulsion with its frequent fatality. This point of view in no way clarifies the convulsive state based on known organic conditions as general paresis, tumor, etc.

In a somewhat different category is the ingenious theory of Rosett. He believes that normally "a stimulus requiring sudden movement on the part of the organism or the narrow focusing of attention, and certain functions such as sleep, defecation, sneezing, coughing, parturition, lead to a temporary reduction or extinction of the cerebral functions." This may lead to a "tonic contraction of the entire skeletal musculature resulting in the posture of decerebrate rigidity."

"The biologic purpose of the reaction is the automatic fixation of the relatively central joints preparatory to any possibly needed movement of relatively distal segments of the body and limbs." To its normal incidence he applies the term "normal epileptoid reaction."

Perhaps this conception helps to explain the tendency of the seizures to appear as the individual is going to sleep or awakening ("Vorzugsmomente" of the German writers), and the very occasional appearance of convulsions in the beginning of ether or chloroform narcosis (Patch).

Yet Rosett is not able to explain the reason for the appearance of that periodic, massive, exaggerated response which constitutes the convulsive state. He has contributed some interesting psychological side lights to the problem.

To discuss the hysterical convulsion would require a consideration of hysteria which would take us too far afield. Obviously its mechanism is quite different from the convulsive state herein considered.

The reason for the periodicity of the convulsive seizure is unknown. The assumption of any special theory hardly explains it. In fact I think that when we know why the attacks are recurrent or paroxysmal we shall have gotten down to the very fundamental understanding of the disorder. Collier believes that the periodicity and other facts argue strongly for a disturbance in metabolism,—a "toxipathic" (*i.e.*, a humoral factor) as the basic cause.

VI

Many have emphasized the element of heredity in the convulsive state. In his recent analysis Muskens shows that about one-third of his cases had epileptic forbears in the direct and collateral line. About one-eighth revealed insanity in the direct

and collateral line. In heredity, alcohol played a part in about one-twentieth of the cases, and lues in only about one-fiftieth. Striking as these figures are they do not aid us át all in the study of the fundamental causes of the seizures.

Before speaking of the pathology, brief reference may be had to the so-called "reflex epilepsy" which belongs to the field of romance. Diseases in the nasal, aural, dental, genital and other spheres were held responsible for the attacks in some mysterious manner. In his analysis of two thousand cases Muskens found no instance of this type. To-day we hear very little of this old myth.

VII

Is there a fundamental pathology to the convulsive state? To be sure, ganglion cell degeneration, subpial marginal gliosis, and other more generalized glioses have been described. Gerstmann found atypical and even foetal cells in the molecular cortical layers. Volland found regularly karyolytic and tigrolytic degenerative changes in the anterior horn cells in myoclonic epilepsy. A milky cloudy pia has been the sole finding in cases of focal epilepsy in which biopsies have been obtained (Muskens, *et al.*). Alzheimer at one time (1898) even went so far as to say that ("Man könnte die epileptischen Anfälle als Folge eines Druckes ansehen, den die herbere geschrumpfte Rindenoberfläche auf das tiefer liegende Hirngewebe ausübe."—One could regard the epileptic seizure as the result of a pressure, which the sharply shrunken cortical surface exerts upon the deeper lying cerebral parenchyma). Yet with the passing of time, a different attitude of mind has been forced upon most observers. This is due to the fact that negative findings have been recorded by careful observers in cases which had neither lasted too long nor been accompanied by mental deficiency or dementia. The general opinion now held is that the pathological changes found are the result of the long enduring process, not the cause (Binswanger, Zabriskie, *et al.*). Hence the idiopathic convulsive state has no essential pathology. Alzheimer and his pupils believe that the convulsive state is a common attribute of warm-blooded animals, and is to be regarded as a reaction produced by a humoral poison on a nervous system in which lessened tolerance, or lowered threshold, has been brought about.

VIII. *Conclusions*

All facts agree with the above concept. It permits the study of neural and extraneural factors,—the cerebral and the *important humoral* ones. It would seem, then, that the convulsive state is either brought about by (1) a group of poisons operating upon the cerebral vascular mechanism producing vasoconstriction and cerebral anemia, then congestion, or (2) by local cerebral disease or disturbed vascular conditions upsetting the vascular equilibrium or by (3) combinations of the above.

Somewhere in his writings, Francis Bacon says that it is easier to derive knowledge from a state of confusion than from chaos. The convulsive state is still a confused one, but thanks to the work of many investigators all over the world, the grim spectre, chaos, has been put to rout.

THE ECLAMPTIC CONVULSION

William E. Caldwell

It must be confessed at once that our knowledge of the eclamptic convulsion has not yet been rescued out of chaos into the more hopeful realm of confusion.

DeLee's dramatic description of the eclamptic convulsion of course is known to the majority of you. Still I will quote it.

"*The Attack.*—The pupils dilate, the eyes are turned, and the head also, to one side; the patient opens her mouth, then the jaw is pulled laterally, and there may be a cry or a sigh. The whole body becomes rigid; the features are distorted; the arms flexed; hands clinched; the feet inverted; the toes flexed, and the whole person drawn to one side in a tonic spasm. This condition lasts for a few seconds, then the jaws open and close violently, the eyelids also, the twitchings beginning in the face, then usually one arm, then the leg, and now the whole body. This is a violent clonic convulsion, which may throw the patient out of bed against any object. Severe injuries can result—even fractures of the skull or long bones; the tongue is protruded; the teeth may chop it up. Foam, often tinged with blood, comes from the mouth. The respiration is completely stopped, the chest being rigid. The pulse is high and strong; later it grows

weaker, but may be hard to feel because of the convulsion. In rare cases the pulse is weak and the arterial tension low from the start, a fact which is explained by degenerative changes in the heart. The blood-shot eyes protrude, the face is swollen, the cyanosis is extreme, the lips are purple—altogether the picture is a horrible one. Gradually the convulsive movements remit, a few twitches or jerks take place, the patient lies quiet, the heart thumping violently against the chest-wall. For a few seconds the woman appears to be dying, but there is a long sigh, and stertorous breathing becomes established, coma supervening. Soon the respirations quiet down. In the favorable cases the patient wakes up after a short time bewildered, severely sore in all the muscles. After from a few minutes to an hour another fit occurs, or she may have no more. With recurring convulsions the intervals become shorter and the patient lies in deep coma all the time."

The pathological changes in fatal cases are distinctive in the liver, where areas of necrosis and hemorrhage with thrombi of agglutinated red cells are found in the periportal spaces. Small or large hematomata frequently underly Glisson's capsule. The kidneys show changes in varying degrees of severity from simple cloudy swelling to the rarer cases of extensive cortical necrosis. Areas of myocardial degeneration are often found in the heart. In the brain and nervous system various findings have been reported—anemia, hyperemia, edema and dehydration. The most constant but by no means invariable findings are multiple hemorrhages of varied size and distribution.

A brief outline of the facts which a satisfactory theory must fit may be given.

Eclampsia occurs in the later months of pregnancy with increasing frequency as term approaches. It is more common in primiparas and in multiple pregnancies and in hydramnios. It has a seasonal incidence, being more frequent in the winter and spring months, and is more common in northern latitudes. It is usually though not always heralded by slight or severe degrees of such symptoms as edema, headache, visual disturbances, epigastric pain, rising blood pressure, albuminuria and oliguria and hyper-reflexia.

The acuteness of onset of the eclamptic convulsion leads naturally to the idea that it is due to some toxin suddenly released into the blood stream, and research has been directed to the discovery of such a toxin. The tendency of eclampsia to improve following foetal death or expulsion suggests a foetal origin, and unsuccessful attempts have been made to isolate toxins from foetal metabolic products, or from fragments of syncytium and amniotic villi which are continually entering the maternal blood stream. The hypothetical escape of foetal blood of unlike group from that of the mother, into the maternal blood stream, with resulting thrombus formation, has not found statistical support. An anaphylactic reaction to foetal products has been port. An anaphylactic reaction to foetal products has been suggested but not proved. Placenta decomposition products have been proposed as the source of the toxin, but proof is wanting.

A more intensive study of the maternal organism during pregnancy and its toxemias has more recently held the center of attention. Chemical studies of the blood and urine have been made in a large number of cases. Most insistent have been the attempts to find in the retention of some product of protein metabolism the cause for the eclamptic explosion. These have led for the most part to negative findings. The blood uric acid is usually raised, but non-protein nitrogen is seldom retained and the nitrogen partition is variable. Recently the toxic qualities of histamine and the guanidines have been studied and have been thought to be important causes of convulsive reactions. The blood sugar is thought by some to be raised in eclampsia, by others to be low. An increase in the lactic acid of the blood has been described. The study of the inorganic constituents of the blood and their equilibria are of great interest. Most writers agree that there is a decreased plasma carbon dioxide combining power. Staeber reports a general tendency to a lowered ratio in the calcium and phosphorus contents of eclamptic blood. Such observations fit in very well with the functions which these substances are held to have in the metabolism of muscle irritability. They are not, however, invariably found in eclampsia. Abnormalities of the thyroid, parathyroids, ovaries

and pituitary have been though to cause eclampsia and isolated cases appear to support such a conclusion, but such theories leave many facts to be explained. In recent studies by means of the capillary microscope, spasmodic contractions of the vessels in toxemic and eclamptic patients have been described which suggest the theory of spasmodic constriction of the cerebral arterioles as initiating the mechanism of eclampsia. More evidence along the lines of this very attractive theory is required.

There is nothing definitely characteristic about an eclamptic to differentiate it from the uremic or even the epileptic convulsions. Convulsions occurring in the latter half of pregnancy without albuminuria and without increase in blood pressure may be eclamptic but should certainly have a thorough neurological examination to exclude other conditions. The marked reduction in the eclamptic rate which occurred during the war in Germany is very significant, since their food supply was greatly curtailed.

Subnormal women, especially when the cardiovascular renal and nervous systems are affeted, should be relieved of every possible strain during their pregnancies.

Normal women cannot be allowed to put a strain on their alimentary, excretory and nervous systems. The bacterial infections occurring during pregnancy are sometimes enough to upset the delicate balance of the woman.

In the vast majority of eclamptics, spontaneous labor occurs and the mortality has been reduced in direct ratio to the discontinuance of operative interference. Some cases still require operative deliveries, but the proportion is small.

The convulsion, the restlessness and irritability added to an already strained cardiovascular system will cause a disastrous end if not controlled.

During the past thirty years the work of Tweedy, Loomis and especially Strogonoff has gradually worn away the prejudice against the use of opiates, and morphine is used to a very great extent in most clinics. For the rapid control of frequently occurring convulsions or mania with the resulting exhaustion, paraldehyd directly into the vein has been effective. Recently Lazard's suggestion of the use of magnesium sulphate directly into the vein has proven of great value in temporarily reducing

the blood pressure and quieting the patient. Together with morphine and bleeding, it seems to have reduced the mortality in this condition. Rest and relief from strain are still most valuable means of treatment. A low protein salt-free diet is of value, but milk in spite of its high protein and mineral salts seems to be just as efficacious in some cases.

No theory has yet been proposed which satisfactorily explains all the phenomena. To recapitulate we may quote the points listed by Williams which the required theory must satisfy.

1. The genesis of the hepatic lesions.
2. Predisposing influence of primiparity, multiple pregnancy, hydramnios.
3. That the disease is more common in northern latitudes than in the tropics.
4. That the incidence increases as pregnancy approaches term.
5. That marked edema is usually a favorable sign, while its absence adds to the gravity of the prognosis.
6. That true eclampsia rarely occurs, whereas chronic nephritis gives rise to increasingly serious trouble in each succeeding pregnancy.
7. That intrauterine death of the foetus is usually followed by improvement.
8. That a milk diet which is high in protein and mineral constituents is as efficacious as one low in protein and free of salt.

The object of the Chairman in having this hackneyed subject once more presented is to enlist the help of the neurologists in solving the various problems which this dread condition presents. We regret that we are not able to bring out any new point or suggestion in this presentation.

A BIT OF FINANCIAL HISTORY OF THE ACADEMY

The rapidity of change during the last half century has been so enormous that one sometimes forgets the gigantic scale upon which our civilization is based. This is shown in a small way by a review of a bit of the old financial history of the Academy.

Less than forty years ago, in 1889, the last complete year in the old building at 12 West 31st Street, the receipts of the Academy amounted to $6,702.62, the expenses to $6,827.21.

In 1888, the Academy determined that it would have to seek a larger building because there was no longer any room for books or a hall large enough to hold the meetings although an extension had been built in the rear of the old building through the efforts of Dr. Abram Dubois, which was known as Dubois Hall.

Funds were raised during 1888 and 1889 amounting to $78,474.03. The land and building cost $284,426.59. The new building was financed through the gifts of Fellows and their friends, the Celine B. Hosack legacy of $70,000 and by a mortgage on the property. In order to make the final payments, the Academy sold $30,000 worth of bonds to the following Fellows:

Hermann Knapp	$5,000
Everett Herrick	2,000
Everett S. Warner	1,000
J. A. Booth	500
E. C. Billington	2,000
William Balser	2,500
C. W. Stimson	2,000
A. L. Loomis	3,000
A. Jacobi	3,000
F. A. Castle	1,000
LeRoy M. Yale	500
Henry D. Noyes	1,000
M. Allen Starr	1,000
Alexander Hadden	4,000
John C. D. Kitchen	1,000
R. Kalish	500

The interest on the bonds was paid regularly and with the increase in dues it was possible to pay off a certain amount of them annually.

In 1890, the Academy was installed in its new building at 17 West 43rd Street. In the annual report of the Treasurer for the year 1891 he writes: "The opening of our new home and the development of its facilities, which are unsurpassed, have been attended, not alone with pleasure to its Fellows and friends, but that which this department has been compelled to recognize, an increase in its expenses."

In May, 1891, the Academy was apparently facing a deficit and an assessment of $10 was levied and six hundred and ninety-eight Fellows subscribed. The dues were increased to $20 a year in 1892. The expenses of the Library had increased at that time and in 1893 there was a still further increase but the salary of the Librarian and the total expenses of the Library for the year 1893 were less than the salary of the Librarian for 1927.

After the new building was opened, the building fund was continued as an open account and in several years there were received in subscriptions $19,776 as well as some income from the general permanent fund and from current account which enabled the Academy to redeem $20,000 worth of bonds in 1893.

In 1897, the Academy borrowed from the bank $7,000 on its note which was used to retire the remaining bonds outstanding. During the following years the admission fees were set aside for the retirement of this note until it was entirely paid in 1905. On October 19 of that year, the Academy voted to appropriate admission fees to the endowment fund and that has been continued to date.

SETH M. MILLIKEN.

SUMMARY OF ACTIVITIES
OF THE
EXECUTIVE COMMITTEE OF THE PUBLIC HEALTH RELATIONS COMMITTEE

Month of January, 1928

Every month several important matters come before the Committee for consideration. With regard to some of them, immediate action can be taken; the majority, however, require the gathering of facts and the weighing of evidence. Due to this, some of the items reappear on the calendar of the Committee many times during the year. Among the subjects which received attention during the past month were:

1. *The Work of the Chief Medical Examiner*

It was with the aid of the Public Health Relations Committee of the Academy that legislation was secured more than a decade ago abolishing in New York City the obsolete and inefficient coroner system and substituting in its place the office of the Chief Medical Examiner. The new system started on January 1, 1918. Under the administration of Dr. Charles Norris, the medico-legal work of the City was carried out with efficiency, honesty and justice.

In recognition of this service, the Committee on Public Health Relations voted to tender jointly with the Committee on Medical Education a dinner to Dr. Norris. On this occasion consideration will be given to a proposal to establish in New York City an institute for the teaching of forensic medicine in connection with the Chief Medical Examiner's office and under the auspices of the several medical schools of the city.

2. *Uniform Classification of Diseases*

Statistical comparisons which are of value to medical science and to public health administration are rendered difficult by a lack of a generally accepted nomenclature in hospital practice. The Committee voted to arrange for a meeting at the Academy to consider the subject to which representatives of the government medical departments as well as the several

national bodies would be invited. The desirability of working out adequate statistical procedures for medical accountancy in hospitals was likewise considered.

3. *Request from the City Housing Corporation*

Consideration was given to a request from the City Housing Corporation for the outlining of a study on the effect of housing on health.

4. *Functions of the New York State Board of Charities*

In conference with the Chairman of the State Board of Charities the powers, the functions and opportunities of the State Board of Charities were discussed and a special subcommittee was appointed to pursue the subject further.

5. *Admission to Tuberculosis Hospitals*

The present method of the admission of patients to tuberculosis hospitals is not fully satisfactory and plans for the improvement of the service were discussed with the appropriate municipal authorities.

6. *Mental Hygiene*

The alleged increase in mental disease and delinquency has prompted the Committee's inquiry into the mental hygiene movement, and a special subcommittee was appointed to study the efforts that are being made in the prevention of insanity and crime.

7. *Clean Streets*

The dust and litter in the streets, although not a major problem in public health, is a matter which should not be neglected. Vigorous public protest against the antiquated and inefficient method in vogue for the collection of ashes and refuse will undoubtedly lead to desirable improvements. The Committee communicated with the Mayor and the Commissioner of Street Cleaning.

8. *Development of Convalescent Care*

Since the time of the study of the facilities for convalescent care which was made by the Committee several years ago and

since the formulation of standards for the guidance of convalescent homes, considerable progress has been made in this city. The importance of coordination of available facilities and of raising the prevailing standards has been generally recognized. The creation of the Convalescence Service in the Hospital Information and Service Bureau has given an impetus to a better understanding of the entire problem.

Miscellaneous

Other matters which came before the Committee during the month were:

Ventilation of school buildings, consolidation of municipal hospitals, the reorganization of the City Health Department, and the need of a change in the composition of the Board of Health; also the so-called Parents' Exposition which is to be held in April (16-28) at the Grand Central Palace.

LIBRARY NOTES

FAUCHARD BICENTENARY EXHIBITION

To those interested in the origin and development of dental literature, which in other words is equivalent to the beginning of dentistry as a branch of medicine, the year 1928 is of intense interest and importance. This year we find is the occasion of three distinct important epoch making events in dental science that entitles each to be so commemorated.

First, the 60th anniversary of the founding of the First District Dental Society in 1868. Second, the 380th anniversary of the publication of the first dental book written (by Walter Hermann Ryff) especially for those then interested in this particular phase of Medicine, 1548. Third, the 200th anniversary of the publication of the first important dental (text) book *Le Chirurgien Dentiste* by Pierre Fauchard which amply entitled him to be called the "Father of Dentistry."

Besides these the year 1928 recalls the anniversaries of the birth of the following men who made important contributions to dental science. 250th of Pierre Fauchard, 1678-1761; 200th of John Hunter, 1728-1793; 100th of James Edward Garretson, 1828-1895; Benjamin Ward Richardson, 1828-1896; Jonathan Hutchinson, 1828-1913; Norman W. Kingley, 1828-1913. Also the 100th anniversary of the death of Robert Woofendale, 1742-1828, the earliest pioneer, of which we have definite information, to have practiced in this country.

The Books of Pierre Fauchard

The progress that dentistry made in its scientific development up to the early part of the eighteenth century is best portrayed in the writings of Fauchard. For centuries it was in an embryonic condition, attaining the highest degree of development in France, until it there reached a point which entitled it to be considered a special branch of medical science. Out of sentiment or jealousy, the dentists before Fauchard's time refrained from publishing anything concerning their art. He was determined to break down this practice by publishing the results of all their studies and experiences, besides the technical details, before closely guarded, which according to the idea of that time constituted the secrets of the profession.

Fauchard did not create the dental art, for as he states, the greater part of the facts enumerated in his works were already known before his time, but were seldom mentioned in the writings of his predecessors. He did, however, make important contributions to this specialty, and credit must be accorded him for his inventions and improvements on the technical side. He placed dentistry on a scientific plane through collecting and incorporating in one book the entire doctrine of the dental art then known, theoretical as well as practical. Not only was Fauchard the first to advocate a broader education for dentists, but he also gave to dentistry its first scientific work. His *Le Chirurgien Dentiste* in two volumes, written in 1723 and published in 1728, was undoubtedly prepared with the idea of conveying all he knew about odontology, and in a manner that would be of greatest help and interest to those who succeeded him. It served its purpose so well that it remained the authoritative work for over a century. His treatise markes a distinct epoch in the progress of dentistry, and may truly be regarded as the first of dental publications in France during the eighteenth century.

In 1773, the first edition was translated into German by Augustinius Buddaneuss. The second French edition was published in 1746, and contained the first accurate account of "pyorrhea aveolaris;" the third was published in 1786, after Fauchard's death. The book was practically completed about 1723. Although carefully written, yet in order to make it as accurate as possible, Fauchard submitted the manuscript to medical friends for additions and corrections. To many, the writings and ideas of Fauchard would today be a revelation.

Upon the completion of the Lister Centenary Exhibition, The New York Academy of Medicine has arranged to commemorate, during the month of February, the above three events, by a public exhibition of dental books, records, photographs, etc. This exhibit will be the most complete and accurate record of the progress of dentistry as portrayed by its literature that has as yet been attempted, and will be as fitting a compliment to our science as could be paid by the medical profession.

The value of a library is the use to which it is put. Were the history of dentistry to again be rewritten, it could easily be compiled in our valuable library.

In arranging the exhibit an attempt has been made to illustrate every particular period in the development of dental literature.

1. Our first knowledge of medicine and of the dental art was derived from stone pillars. Examples—(a) Code of Hammurabi sculptured, *c.* 2000 B. C. (b) Babylonian Tablet. Then from various papyri. (c) Papyrus Ebers, *c.* 1500 B. C.

2. Dentistry's debt to medicine. The period prior to 1500 A. D., the earliest printed medical books known as "Incunabulas." A few will be shown to represent the two hundred odd medical writers that laid the ground work for all our early dental material prior to the time of Fauchard.

3. An example of this debt—Eustachius—*Libellus de dentibus,* 1563, with those works he utilized to write the first dental anatomy and histology. Actuarus (c. 1280) Aretaeus (270 B. C.) Aristotle (384-322 B. C.) Celsus (25 B.C.—50 A. D.) Cicero (106-4 B. C.) Erasistratus (300-245 B. C.) Fallopius (1523-62) Galen (130-200) Hippocrates (360-377 B. C.) Meletius (*c.* 700 B. C.) Pliny (27-79) Ryff (1500-62) Vesalius (1514-62) Arculanius (-1484).

4. First dental book published, written for the laity and not profession. Series of twelve editions of *Zene Artznei's* of which we have a record as having been published between 1530 and 1576. Grouped with the original works of Avicenna, Celsus, Galen, Mesue, Pliny and Vigo from which works the anonymous author (Meister Lorentz?) obtained his material.

5. Series of "Firsts" in various countries.

a. Germany, 1548, Ryff, W. H. *Nutzlicher bericht, . . . wie man den Mundt, die Zan. . . .* First to be published for the profession.

b. Spain, 1557, Martinez, Fr. *Coloqvio Breve Y copediofo. . . . .*

c. Italy, 1563, Eustachius, B. *Libellus de dentibus.*

d. France, 1582, Hemard, Urbain. *Recherche De La Vraye Anathomie Des Dents.*

e. England, 1686, Allen, Chas. *The Operator for the Teeth*: . . .

f. America, 1801, Skinner, R. C. *A Treatise on the Human Teeth*, . . .

g. Mexico, 1823, Parrott, G. S. *Reflexiones La Importance de Conservar la Dentadura.* . . .

6. Dental books published prior to 1700. Digitus, Jn., 1587; Horsti, 1596; Rulandi, 1597; Ingolstetter, 1595; Liddle, 1628; Strobelberger, 1630; Typkowski, 1674; Stisser, St. Fr., 1675; Martin, B., 1690.

7. Fauchard's *Le Chirurgien Dentiste.* Complete editions—1728, 1733, 1746, and 1786. Photographs of the original manuscript of vol. 1. His Chateau. Historical Records of his work.

8. Fauchard's Contemporaries. The most complete exhibit of important dental literature of this period. France—Jourdain, 1724; Gerauldy, 1737; Bunon, 1741, 1743; Mouton, 1746; LeCluse, 1754; Bourdet, 1757, 62, 71, 82, (2) 87; Auzebi, 1771; De Chemant, 1797; Mahon, 1798. Germany—Kraeutermann, 1747; Stumpff, 1753; Runge, 1755; Pfaff, 1756; Pasch, 1767; Brunner, 1771; Courtois, 1778; Plenck, 1778, 79, 86, 1803; Serres, 1778, 91, 1804; Andree, C. A., 1790; Zincker, 1794; Hirsch, 1796; Ettmuller, 1798, 1800. Italy—Carnelli, 1793; Comparini, 1793. England—Hurlock, 1742; Berdmore, 1768, 70; Ruspini, 1750, 68, 97; Woofendale, 1783; Blake, 1801; Fox, 1803.

9. John Hunter's *Natural History of the Human Teeth.* An example of the intense interest in dentistry of that period as shown by the number of editions and translations published. London, 1771, 78, 78, 2nd edition, 1803, 35, 61; Dordraci, 1773; Leipzig, 1780; Hague, 1780; Paris, 1839; Philadelphia, 1839; New York, 1839.

10. Contemporary American dentistry as gathered from early New York newspapers beginning with James Mills, 1735;

the Woofendales, Baker, Poree, Hamilton, Dubuke, Fisher, Dustwige, the Greenwoods, Skinner, LeMayeur, and others.

11. First dental publications in America. Fourteen in number, 1801-28.

12. Constitution and Transactions of the first dental societies. "Society of Surgeon Dentists of the City and State of New York," 1834. First minute books of the "Dental Surgeons of the City of New York," 1860- , the predecessor of our society. "First District Dental Society," 1863- "New York Odontological Society," 1867- .

13. Series of Vol. 1 of the earliest dental periodicals.

B. W. WEINBERGER.

RECENT ACCESSIONS

Abraham, J. J. The surgeon's log.
N. Y., Dutton, 1926. 361 p.

Armstrong, C. W. The survival of the unfittest.
Lond., Daniel co., 1927. 160 p.

Avitaminosen und verwandte Krankheitszustände. Hrsg. von W. Stepp und P. György.
Berlin, Springer, 1927. 817 p.

Bainbridge, W. S. Il problema del cancro.
Roma, Pozzi, 1927. 365 p.

Banister, J. B. [et al.] The queen Charlotte's practice of obstetrics.
Lond., Churchill, 1927. 629 p.

Barker, J. E. Chronic constipation.
Lond., Murray, 1927. 503 p.

Bernard, C. An introduction to the study of experimental medicine.
N. Y., Macmillan, 1927. 226 p.

Blanton, S. & Blanton, M. G. Child guidance.
N. Y., Century co., 1927. 301 p.

Brain, W. R. Galatea, or the future of Darwinism.
Lond., Kegan Paul, [1927]. 95 p.

Browne, Sir T. The works of . . . Ed. by C. Sayle.
Edinb., Grant, 1927. 3 vols.

Cabot, R. C. Physical diagnosis. 9. ed.
N. Y., Wood, 1927. 536 p.

Carless, A. & Wakeley, C. P. G. Manual of surgery. 12. ed.
Lond., Baillière, 1927. 1544 p.

Carlill, H. F. Socrates, or the emancipation of mankind.
N. Y., Dutton, 1927. 84 p.

Clendening, L. The human body.
N. Y., Knopf, 1927. 399 p.

Crafts, L. M. Epidemic encephalitis.
Bost., Badger, 1927. 273 p.

Crew, F. A. E. The genetics of sexuality in animals.
Cambridge, Univ. pr., 1927. 188 p.

Crookshank, F. G. Diagnosis: and spiritual healing.
Lond., Kagan Paul, 1927. 101 p.

Dimmer, F. & Pillat, A. Atlas photographischer Bilder des menschlichen Augenhintergrundes.
Leip., Deuticke, 1927. 84 plates.

Diseases of the nose, throat and ear. 2. ed.
Bristol, Wright, 1927. 440 p.

Driesch, H. Mind and body.
Lond., Methuen, 1927. 163 p.

Duke-Elder, W. S. Recent advances in ophthalmology.
Lond., Churchill, 1927. 343 p.

Falkner, H. G. Actinotherapy.
Lond., Baillière, 1927. 152 p.

Flechsig, P. Meine myelogenetische Hirnlehre.
Berlin, Springer, 1927. 122 p.

Fränkel, S. Die Arzneimittel-Synthese. 6. Aufl.
Berlin, Springer, 1927. 935 p.

Fremantle, F. E. The health of the nation.
Lond., Allan, 1927. 209 p.

Fürstenau, R., Immelmann, M. & Schültze, J. Leitfaden des Röntgenverfahrens. 5. Aufl.
Stuttgart, F. Enke, 1927. 529 p.

Gibson, A. G. & Collier, W. T. The methods of clinical diagnosis.
Lond., Arnold, 1927. 398 p.

Goodall-Copestake, B. M. The theory and practice of massage.
N. Y., Hoeber, 1927. 267 p.

Groves, E. W. H. A synopsis of surgery. 8. ed.
Bristol, Wright, 1927. 674 p.

Haire, N. Hymen, or the future of marriage.
Lond., Kegan Paul . . . 1927. 95 p.

Hale-White, W. Materia medica, pharmacy, pharmacology and therapeutics. 19. ed.
Lond., Churchill, 1927. 712 p.

Hannan, J. H. The flushings of the menopause.
Lond., Baillière, 1927. 52 p.

Heim de Balsac, R. Pratique cardio-vasculaire: l'atropine.
Paris, Doin, 1927. 223 p.

Hogben, L. T. The comparative physiology of internal secretion.
Cambridge, Univ. pr., 1927. 148 p.

Holländer, E. Æskulap und Venus.
Berlin, Propyläen Verl., 1928. 488 p.

Hume, E. E. Max von Pettenkofer.
N. Y., Hoeber, 1927. 142 p.

Jamieson, J. D. H. Operative dentistry.
Edinb., Livingstone, 1927. 215 p.

Kopeloff, N. Why infections?
N. Y., Knopf, 1926. 182 p.

Kraepelin, E., & Lange, J. Psychiatrie. 9. Aufl.
Leip., Barth, 1927. 2 vols.

Kretschmer, E. Der sensitive Beziehungswahn.
Berlin, Springer, 1927. 201 p.

Lake, R. & Peters, E. A. Handbook of diseases of the ear. 5. ed.
Lond., Baillière, 1927. 310 p.

Llewellyn, L. J. Aspects of rheumatism and gout.
Lond., Heinemann, 1927. 295 p.

Lucas, W. R. Outwitting obesity and thinness.
Lond., Lutterworth's, [1927], 38 p.

MacAusland, W. R. Poliomyelitis.
Phila., Lea, 1927. 402 p.

McCoy, J. D. Applied orthodontia. 2. ed.
Phila., Lea, 1927. 322 p.

McDougall, W. Character and the conduct of life.
Lond., Methuen, 1927. 287 p.

Macfie, R. C. Sunshine and health.
N. Y., Holt, 1927. 256 p.

McKendrick, A. Medico-legal injuries.
Lond., Arnold, 1927. 341 p.

McKendrick, A. & Whittaker, C. R. An x-ray atlas of the normal and abnormal structures of the body. 2. ed.
Edinb., Livingstone, 1927.

MacKenty, J. E. Cancer of the larynx.
[s.l.], 1927. 63 p.

McKenzie, D. The infancy of medicine.
Lond., Macmillan, 1927. 421 p.

McLester, J. S. Nutrition and diet in health and disease.
Phila., Saunders, 1927. 783 p.

Martin, F. H. South America.
N. Y., Revell co., 1927. 435 p.

Meldepflichtigen (Die) Berufskrankheiten. Hrsg. von F. Koelsch.
München, Lehmann, 1926. 161 p.

Minchin, W. C. A study in tubercle virus, polymorphism, and the treatment of tuberculosis and lupus with oleum allii. 3. ed.
Lond., Baillière, 1927. 110 p.

Muthu, D. C. Pulmonary tuberculosis. 2. ed.
Lond., Baillière, 1927. 381 p.

Muthu, D. C. A short account of the antiquity of Hindu medicine. 2. ed.
Lond., Baillière, 1927. 52 p.

O'Donovan, W. J. Dermatological neuroses.
Lond., Kegan Paul, 1927. 99 p.

Oertel, H. Outlines of pathology.
Montreal, Renouf, 1927. 479 p.

d'Olivet, F. The healing of Rodolphe Grivel: congenital deaf-mute.
N. Y., Putnam, 1927. 273 p.

Oppenheimer, C. Lehrbuch der Enzyme.
Leip., Thieme, 1927. 660 p.

Partridge, W. Dictionary of bacteriological equivalents. French-English: German-English: Italian-English: Spanish-English.
Lond., Baillière, 1927. 140 p.

Pilcz, A. Lehrbuch der speziellen Psychiatrie. 7. Aufl.
Leip., Deuticke, 1926. 330 p.

Psychischen (Die) Heilmethoden. Hrsg. von. K. Birnbaum.
Leip., Thieme, 1927. 462 p.

Radin, P. Primitive man as philosopher.
N. Y., Appleton, 1927. 402 p.

Ray, M. B. Rheumatic diseases.
Lond., Kegan Paul, 1927. 91 p.

Readings in urban sociology. Ed. by S. E. W. Bedford.
N. Y., Appleton, 1927. 903 p.

Rohdenburg, G. L. Clinical laboratory procedures.
N. Y., Macmillan, 1927. 266 p.

Rolleston, Sir H. Idiosyncrasies.
Lond., Kegan Paul, 1927. 119 p.

Romanis, W. H. C. & Mitchiner, P. H. The science and practice of surgery.
Lond., Churchill, 1927. 2 vols.

Russell, P. Benjamin Franklin.
N. Y., Brentano's, 1926. 332 p.

Schilling, V. Das Blutbild.
Jena, Fischer, 1926. 292 p.

Schrumpf-Pierron, P. Tobacco & physical efficiency.
N. Y., Hoeber, 1927. 134 p.

Seligmann, S. Die magischen Heil-und Schutzmittel.
Stuttgart, Strecker, 1927. 309 p.

Skalweit, A. Die deutsche Kriegsernährungswirtschaft.
Stuttgart, Deut. Verl.-Anst., 1927. 277 p.

Smith, E. F. Old chemistries.
N. Y., McGraw-Hill, 1927. 89 p.

Steiner, E. B. The eradication of leprosy from the world.
Cuttack, Orissa mission pr., 1927. 175 p.

Stopes, M. C. Contraception. 2. ed.
Lond., Bale, 1927. 479 p.

Stumpf, C. Die Sprachlaute.
Berlin, Springer, 1926. 419 p.

Thom, D. A. Everyday problems of the everyday child.
N. Y., Appleton, 1927. 349 p.

Thouless, R. H. The control of the mind.
Lond., Hodder, 1927. 203 p.

Traguair, H. M. An introduction to clinical perimetry.
Lond., Kimpton, 1927. 264 p.
Vesceilius, E. A. Music and health.
N. Y., Goodyear bk. shop, 1927. 120 p.
Wilson, T. S. Tonic hardening of the colon.
Lond., Oxford pr., 1927. 210 p.
Woollard, H. Recent advances in anatomy.
Lond., Churchill, 1927. 302 p.
Young, J. A text-book of gynecology. 2. ed.
Lond., Black, 1927. 338 p.
Your weight and how to control it.
N. Y., Doran, 1927. 260 p.
Zwei grosse Naturforscher des 19. Jahrhunderts. Ein Briefwechsel zwischen Emil DuBois-Reymond und Karl Ludwig.
Leip., Barth, 1927. 240 p.

LIBRARY DELIVERY SERVICE

A messenger service for the library has been established and in future by telephoning or writing, the Fellows may order what books they desire up to the number of five. In Manhattan and the Bronx the charge will be twenty-five cents per delivery. The same charge will be made if the messenger is sent for to return the books. The delivery service will be between the hours of nine A. M. and five P. M., every day except Sundays and holidays. To Fellows in Queens, Kings, Richmond and outside the city limits delivery will be made by express, collect, or by parcel post, with a minimum charge of twenty-five cents.

NOTES

CANDIDATES ELECTED TO FELLOWSHIP, JANUARY 5, 1928

Albert Herman Aldridge, M.D.....33 East 68th St.
Louis Simon Aronson, M.D.....268 West 91st St.
Edward Arthur Bullard, M.D.....47 East 57th St.
Meredith Fairfax Campbell, M.D.....33 East 68th St.
Charles Goodliffe Darlington, M.D.....124 West 79th St.
Waldo Beattie Farnum, M.D.....33 East 68th St.
Hermann Feit, M.D.....30 East 40th St.
Monroe Edwin Greenberger, M.D.....129 West 46th St.
Paul Gross, M.D.....1129 Madison Ave.
Gerald Harrison Grout, M.D.....121 East 60th St.
James Swift Hanley, M.D.....40 West 55th St.
Wendell Lochead Hughes, M.D.....170 East 95th St.
Robert LeRoy Hutton, M.D.....101 East 74th St.
Harry George Jacobi, M.D.....119 East 84th St.
William Lloyd James, M.D.,
328 Undercliff Ave., Edgewater, N. J.
John Joseph Honan Keating, M.D.....111 East 75th St.
George Bolling Lee, M.D.....20 East 66th St.
Aubrey B. MacLean, M.D.....106 East 60th St.
Eugene Ernest Marcovici, M.D.....485 Park Ave.
Thomas Andrew Northcott, M.D.....17 East 38th St.
Maurice M. Pomeranz, M.D.....911 Park Avenue
Beverly Chew Smith, M.D.....130 East 56th St.
Mortimer Dudley Speiser, M.D.....224 East 17th St.
Walker Ely Swift, M.D.....164 East 72nd St.
Martin G. Vorhaus, M.D.....50 Central Park West
David Paul Waldman, M.D.....1050 Park Ave.
Benjamin Philip Watson, M.D.....1125 Fifth Ave.
William Louis Wheeler, M.D.....348 West 22nd St.
McIver Woody, M.D..405 Westminster Ave., Elizabeth, N. J.
Peter Yudkowsky, M.D.....514 West End Ave.

And for Associate Fellowship

Edith Mulhall Achilles, Ph.D.....4 East 95th St.
Robert Chambers, Ph.D.....1060 Park Ave.
Harry H. Sobotka, Ph.D.....405 East 58th St.
Gladys Griffith Tallman, A.M.....780 Riverside Drive

BEQUESTS AND LEGACIES

During the last three years the Academy has been fortunate in having been mentioned in the wills of a considerable number of Fellows.

It received a legacy of $5,000 from the late Edward B. Bronson, in 1926, the income of which was to be used for the general purposes of the Library.

During 1927 it received a large legacy from the late Dr. Walter B. James, of $25,000, the income to be used for the general purposes of the Academy.

The officers and Trustees of the Academy have been consulted in regard to proposed bequests on several occasions during the recent years. A lawyer, in behalf of a client, asked the Trustees if the Academy would accept a bequest amounting to approximately $250,000, the income to be applied to advance medical research in medical schools, hospitals and laboratories. The prospective legator desired to provide in his will that no grant should be made to any individual of a religious faith specified by him, nor to any institution which was under the control of individuals of a certain religious faith. The lawyer in question was advised by the Trustees that the Academy would not accept a bequest under such conditions.

The Academy has been offered an endowed lectureship, the income of which would be a relatively small amount, for the purpose of giving an annual lecture on one of the specialties of medicine, which would carry the name of a physician formerly of New York City. The Trustees, however, felt that it would be wiser not to accept such an offer.

A bequest for a lectureship was declined by the Trustees because the sum of money was not large enough, and the name of the lectureship was not sufficiently important to warrant the Trustees to accept this responsibility.

A third bequest has been made to the Academy for the purpose of giving an annual lecture, and the amount of money bequeathed is sufficient for this purpose, but it is specified in the will that the lecture and the topic of the lecture should be specified by an association having its headquarters outside of New

York City. The Trustees declined to accept this bequest on the ground that it was improper to call a special meeting of the Academy, if the topic and the lecturer were to be selected by any other agency than the Academy itself.

There are several other wills in regard to which either the officers or the Trustees of the Academy have been consulted, which provide for lectureships, but in which such restrictions as have been made, are entirely satisfactory to the Trustees.

The Academy has, at the present time, a large annual expenditure, nearly three-quarters of which is defrayed by income from endowment. It is, however, in continued need of additional funds, and the largest item of its budget is for the maintenance of the Library.

The City of New York is the largest medical center in the world. It has the largest number of practicing physicians, the greatest hospital facilities, maintains five medical schools and should have the most useful Library to meet the needs of the physicians and the public, which should offer the most modern facilities for bibliography, reference and photostat work and which should maintain a delivery service. There may be a need of several small reading rooms in other parts of the city.*

The collection of classics and incunabula should be constantly added to, and the possibility of a research division of the Library should be given serious consideration.

The Academy has accumulated a fairly large collection of engravings, etchings and mezzotints of physicians and scientists. It is rare, however, to find one made within the past fifty years as photography has replaced these older arts. Fellows of the Academy are urged to leave to the Academy any photographs they may have of older or contemporary physicians and scientists and also to give to the Academy one of their own.

It may well be that some of the Fellows will think faovrably of remembering the Academy in their wills. The Council and Trustees, therefore, express the hope that Fellows of the Academy and their friends, who desire to leave bequests in their wills

*See report on Needs of the Library, BULLETIN No. 6, second series, Volume II, June, 1926.

in favor of the Academy, will either have sufficient confidence to leave it to the Academy unrestricted or that they will consult with any of the officers or Trustees as to whether or not a certain restriction as to the use of their money would be acceptable to the Academy.

ANNOUNCEMENT

The Trustees have made arrangements to have lunches served daily. A cook is employed by the Academy and the members of the staff pay a small sum to cover the cost of food. This action was taken chiefly for the convenience of the members of the staff, but Fellows may have lunches served in the Reception Room at a cost of 50 cents. Any Fellow desiring lunch should notify the Academy telephone operator.

DEATHS OF FELLOWS

Calvin Thayer Adams, M.D., Sound Beach, Connecticut; graduated in medicine from the College of Physicians and Surgeons, New York City, in 1884; elected a Fellow of the Academy April 4, 1889; died January 4, 1928. Dr. Adams was a member of the Obstetrical Society and of the Alumni Association of New York Hospital.

Charles Milbank Cauldwell, M.D., 59 West 46th Street, New York City; graduated in medicine from the College of Physicians and Surgeons, New York City, in 1879; elected a Fellow of the Academy January 3, 1884; died January 17, 1928. Dr. Cauldwell was a Fellow of the American Medical Association, a member of the National Tuberculosis Association, and Consulting Physician to the St. Francis and St. Joseph Hospitals, and Stony Wold Sanatorium.